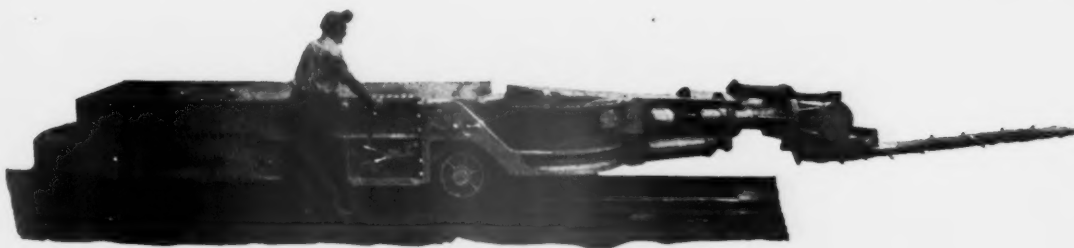


The 414 - book 1
**MINING
CONGRESS
JOURNAL**

• THEY OVERCUT • CENTERCUT • CENTERSHEAR •



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• THEY BOTTOMCUT • HAVE BAR TILT AND ROLL BAR •

January, 1936

There's a Lot of **INSPIRATION** *in a Brick*



NO, an artist probably wouldn't agree that there is any inspiration in a brick, but O-B development engineers most certainly would. It is almost impossible to name a useful article which is more dependable than the sturdy, serviceable paving brick. More to the point, however, is the fact that simple objects such as this always set the standard of dependability—the standard which O-B engineers have before them constantly as an inspiration and a measuring stick, whether they are designing mine hangers or motor starters. With this conception of dependability, it is not strange that O-B overhead line materials, safety and control devices, rail bonds, and locomotive equipment last longer in service, require less maintenance and may be depended upon day in and day out to contribute more than their share to uninterrupted and, consequently, more profitable mining operations.

The famous O-B
complete suspension

OHIO BRASS COMPANY
MANSFIELD, OHIO

1805-M

Specify O-B, and you specify Dependability

A PRODUCT AND POLICY THAT *Guarantee* PROFITABLE MINE CAR PERFORMANCE



One of 37 Timken-equipped automatic bottom dumping cars built by Sanford-Day Iron Works for Central Indiana Coal Company. Average net load 16 tons.

NO other type of bearing used in mine cars can even approach the performance record of Timken Bearings.

For 15 years Timkens have carried the mining industry's heaviest loads in mine cars of every type and size—and carried them with maximum satisfaction and profit to the operators.

During this time over 250,000 Timken-equipped mine cars have been placed in service in 1,000 mines.

Back of the matchless load protection of Timken Bearings is another form of protection equally important to the mine owner. This is the Timken policy of standing back of every Timken Bearing that goes in a mine car to assure the safety of the operator's investment—a policy that is supported by a large financially strong institution with a record of 38 years of successful operation—15 years in the mine car field. You can't afford to overlook that protection. Specify Timken-equipped.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN TAPERED ROLLER BEARINGS

JANUARY, 1936

The Mining Congress Journal

Volume 22

JANUARY, 1936

Number 1

COMING! FEBRUARY

The February issue, which will be available the 10th of the month, will present a Review and Forecast for the mineral industries.

AMONG THE TOPICS . . .

Mining in California
The Year in Colorado
Arizona—Mining State
Utah—Mineral Producer
Tri-State Field in 1935
Montana Mining in 1935
New Mexico's Mining Year

AND FOR COAL . . .

Reviews of the various fields by W. J. Jenkins; L. C. Madeira; C. B. Huntress, C. E. Lawall, W. E. E. Koepler, N. E. Cross, M. J. Hartnedy.

NEWS will cover all events of importance in the field and in Washington, specializing upon events having industry-wide bearing.

AND

The United States Bureau of Mines and its service to the industry

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REVIEW NUMBER 1936

This issue will be of more than ordinary importance and interest. Some of its features being:

The Zinc Industry—
By Stanley A. Easton

New Uses for Copper—
By B. B. Caddle

Old and New Uses for Lead—
By F. E. Wormser

New Markets and Uses for Zinc—By R. B. Paul

The Outlook for Lead—
By J. F. McCarthy

and

Practical Operating Papers—
16 pages of them—covering many phases of safe and efficient production.

AND

First preliminary report on Mechanical Mining by F. G. Tryon and G. B. Southward, and the Operators' Committees of the A. M. C.

Published monthly by The American Mining Congress, JULIAN D. CONOVER, Secretary, Publisher, Munsey Bldg., Washington, D. C. Copyright, 1936, by The American Mining Congress. Entered as Second Class Mail Matter January 30, 1915, at the Post Office at Washington, D. C. Yearly subscription, United States and Canada, \$3.00; Foreign, \$4.00; single copies, \$0.30.

J. F. CALLBREATH
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Roebling...

*The pacemaker in
wire rope development*



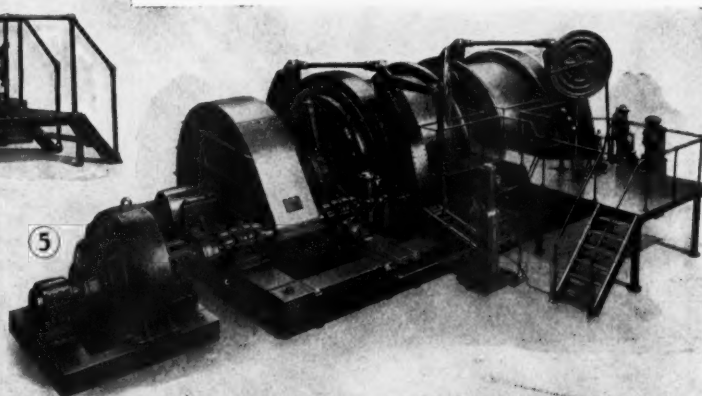
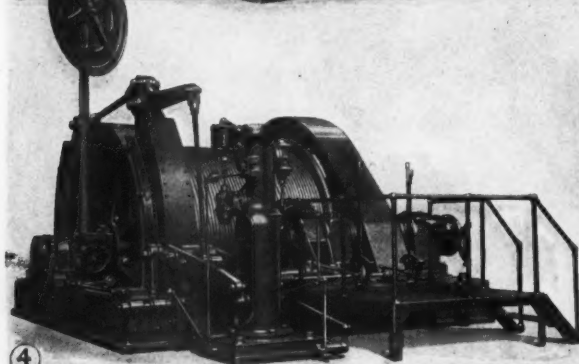
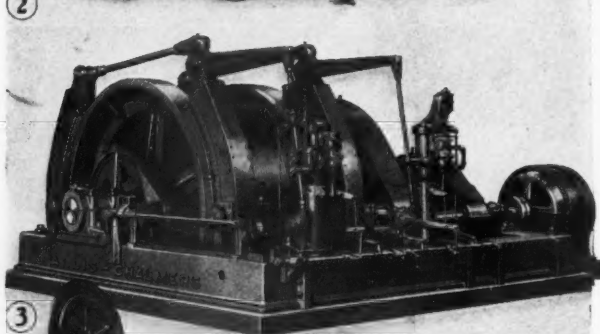
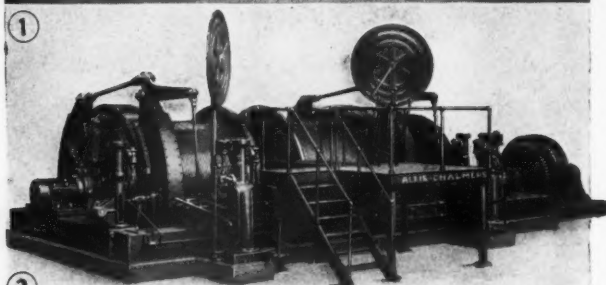
THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

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HOISTS — and

HOIST MOTORS



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- ② 46,000-lb. rope pull; 1500-ft. per min.
- ③ 24,600-lb. rope pull; 400-ft. per min.
- ④ 20,000-lb. rope pull; 1800-ft. per min.
- ⑤ 44,000-lb. rope pull; 800/2000-ft. per min.

ALLIS-CHALMERS hoists ranging in size from medium to the largest built will be found in all the principal mining centers. They are operating on slopes and shafts, the latter for some of the deepest mines ... hoisting more than a mile. Some are arranged for automatic operation.

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Allis-Chalmers manufactures both the mechanical and electrical parts of hoists. The importance of this where there are so many interconnected details between mechanical and electrical parts is obvious. When all related factors are taken care of by one organization working out the details in complete co-operation it insures to the purchaser a well balanced design and perfect co-ordination between mechanical and electrical parts.

Allis-Chalmers hoists insure economy and safety in operation for years to come as demonstrated by the many major successful installations in all mining districts.

They are described in Bulletin 1830.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee —

MAGNITUDE

No sales manager can overlook or under-estimate any market for his company's product that promises substantial return.

If the product is sold to the mining industry he cannot afford to forget that the industries that comprise mining spent more than 300 millions in 1935 for equipment and supplies.

The following taken from figures submitted by twenty-five representative producers reflect the tremendous purchasing power of the mines:

COAL (14 Companies)

Mining Machinery	\$686,437.20
Electrical Supplies	430,361.25
Lubricants	466,276.60
Mine Cars	556,410.43
Explosives	776,242.21
Rails	754,247.72
Wire Rope	271,548.07

METALS (11 Companies)

Flotation Reagents	\$447,367.35
Electrical Supplies	908,171.44
Wire Rope	292,991.40
Mine & Mill Mach.....	3,724,117.16
Ore Cars	947,910.96
Drills & Drill Steel.....	889,693.80
Explosives	1,810,117.48

The companies furnishing this information are geographically located to cover the mining districts and each is a representative company in its field.

Do You Wish to Contact This Gigantic Market?

You can do so, efficiently, completely and effectively by using the Sales Services offered by The American Mining Congress. These include:

- (1) THE MINING CONGRESS JOURNAL, with a guaranteed Circulation of approximately 80,000 copies for the year 1936.
- (2) THE COAL EXPOSITION, which brings to one point approximately 90% of the purchasing power of the coal industry.
- (3) THE METAL MINING EXPOSITION, which enables the Manufacturer to effectively cover, intensively, a substantial percentage of the metal mining market.
- (4) THE YEAR BOOK on Coal Mine Mechanization, sponsored by the Coal Division, The American Mining Congress; the only medium carrying papers presented to Cincinnati Convention and Exposition, and already established as a reference text book for the operating official.

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Exide Batteries of Canada, Limited, Toronto

Social Justice

AM I my brother's keeper?

This question, through the ages, has carried with it the thought that Cain was charged with the responsibility of caring for his brother Abel when, as a matter of fact, his obligation was that he should not interfere with his brother's natural rights, chief of which was his right to live.

Social justice, today, seems to carry the idea that one man has a right to demand employment from another.

All men are free and equal; free to accept or reject an offer of employment; free to make a job for themselves; free to make a job for others but under no obligation to employ others.

If John Smith can buy my service and can buy material upon which to employ that service, and thus create a commodity which can be sold for an amount equal to the cost of labor and material plus a profit and enough in addition to cover costs of insurance against the involved business hazards, then John Smith is not only a good business man but a benefactor to such of his employees as might not otherwise be able to find employment.

None of these employees has any better right to demand employment from John Smith than he has to demand of such employees that each of them shall give him a job. Otherwise all men would not be free and equal.

It will be said that every man who has accumulated wealth is, to the extent thereof, put under special obligation; and that is true to the extent of his proper tax-paying burden.

But beyond that burden, which all others similarly circumstanced are bound to carry because of legal requirements, his obligation ceases. Aside from what he eats and wears, wealth, no matter what its form, is useless to its possessor except as it is either directly or indirectly put to work.

If his wealth is in lands and buildings the Government will soon take it from him in taxes unless he makes the property earn its way.

If his wealth is in money, which is but a certificate of wealth, it is entirely useless to him or to anyone else except he either employs it directly in some enterprise calling for the employment of men, or loans it to others who will so use it.

If he were to hoard this money and take it entirely out of use and if all others who possess money should do likewise, some substitute for money would be quickly devised. This was demonstrated in 1933 when city after city issued script to facilitate business transactions. It was partially demonstrated by the nationalization of gold and silver, when the metallic money of the nation was entirely withdrawn from circulation. Nothing perceptible happened because of that withdrawal.

The penalty for non-use of accumulated wealth is the loss of its earning power, without which its possession is of no value. The original man had no capital; when he created more than he used he became a capitalist.

The wealth of the world is but saved-up labor. If it were equally divided the world would return in a short time to the pastoral life of the ancients.

Accumulated wealth is the very essence of modern industrial life. Without it there would be no jobs, no employment.

Those who prate of social justice would divide this wealth. No plan could be devised which would work greater injustice upon those who cannot make employment for themselves.

So-called social justice is as impractical as the Townsend Plan.

I am not my brother's keeper. I owe him only that I shall not interfere with his right to do for himself; that I shall not aid in depriving him of the opportunity to plan his own life work nor the discipline essential to his development, nor the pleasure which always follows intelligent planning and persevering effort.

Beyond those legal obligations, which all are bound to perform, two motives, and two only, should be relied upon to perpetuate or to create social justice.

First: the desire for profit which leads to altogether the most practical aid to those who desire employment.

Second: the impulses of those who follow the "Kindly Light"; who seek always to help the less fortunate.

It will prove a brutal thing to substitute legal requirements for human love; to reduce the joy of giving to submission to the mandate of the tax collector.



Handle It and Drive It The LINK-BELT Way

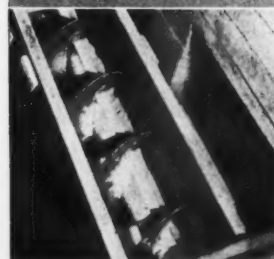
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*for Positive Transmission
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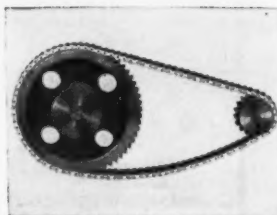
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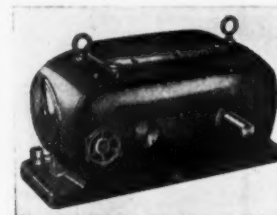
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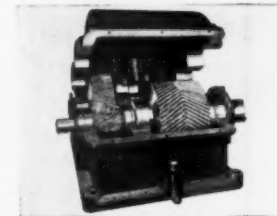
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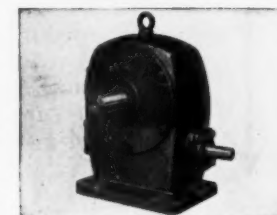
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Link-Belt worm gear reducers are made in a wide range of ratios and capacities, single and double reduction, horizontal and vertical types. Send for Book No. 1524.



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The Mining Congress Journal



Volume 22

JANUARY, 1936

Number 1

E. R. COOMBES, Editor

A Journal for the entire mining industry published by The American Mining Congress

A Resourceful Coal Industry

THE SPOTLIGHT has continued to shine brightly upon the coal industry during 1935. Most of what has been said, and what has been written about the industry has had to do with the necessity for and the application of the various types of legislation which were designed to make a better boy of the culprit. But while great numbers of coal men have transferred their headquarters temporarily to Washington, still greater numbers have remained at home, intent upon efficiently producing the Nation's coal requirements. Someone had to make the money to meet the taxes imposed by the legislation. In some coal districts this tax reaches the interesting figure of 10 cents a ton. And most coal producers would feel that they were "in the money" if they could make a profit of anything like 10 cents a ton.

Mining men are a resourceful lot. They must be to successfully win their product from Old Mother Earth. Most progressive coal men have not sat idly by trusting to some miracle to save them from bankruptcy. They have been busy keeping abreast of the rapidly changing tide of production methods, for modernization—mechanization—of production and preparation has been going forward at an increasing rate. Recently a coal man stated that "changes in production methods are so rapid that even those within the industry are constantly confronted with the necessity for revising their ideas of what constitutes the best practice in organization, methods, and machines." Therefore, coal men, generally, are not placing any great confidence in the efficacy or permanency of the Guffey law, or in political salvation of their industry. They realize that their major problem is successfully meeting the competition of substitute fuels with a product—at a price—that will give their customers the greatest value for their money.

To this end a group of operating men, formed into specialized committees, sponsored by The American Mining Congress, will late in January make their first reports on operating practice, based on months of study. In addition, another large group, representing every coal producing field, will combine with the manufacturers of mine equipment in the development of the great coal mining Convention and Exposition which is held annually at Cincinnati.

No matter how bitterly the political battle may rage, these groups of men will devote their primary interest to the permanent upbuilding of their industry through efficient and safe production methods. They are convinced that the ultimate answer to coal's problems is quality fuel at a reasonable price, prepared to meet consumer needs.

As We Face the New Year

IN ANY DEPRESSION those first to feel its force are those affiliated with the Natural Resources Family. That minerals have suffered during the present difficulties needs no testimony. Dismal, abandoned mining camps and closed down mines, mills, and properties bear mute evidence. But the tide is turning. As we face the new year the picture is definitely changing. Steel mills, the outstanding barometer of industry, are again operating over 60 percent capacity; the copper industry has drastically reduced its surplus stocks, and mines and mills are again in production. Lead and zinc are moving with greater rapidity, and at prices that make the industry take on a brighter outlook. The coal industry produced in 1935 more than 350,000,000 tons, and its markets are booming.

Mining is one of the country's greatest assets. According to figures just released by the United States Bureau of Mines, mines furnish a considerable proportion of our national wealth. These figures show that of a conservatively estimated national wealth of 163 billions of dollars, mines furnish between 60 and 70 percent. Since the beginning of the 19th Century our country has produced more than one billion ounces of gold; 12 billion ounces of silver; 40 billion pounds of zinc; 11 billion pounds of copper; and 136 billion pounds of lead. It furnishes the livelihood, in some form, for some 25 million people; employs almost 2 million persons, with an annual payroll of better than 1 billion dollars. It furnishes 55 percent of all of the revenue freight of our railroads, and pays 22 percent of our national tax bill. Its products are the magic key to science and the future. It is safe to say that upon minerals rests our present day civilization and our hope for greater advancement as a people. Therefore, all types of legislation designed to foster or to shackle this great national

asset should be carefully studied and applied only after the fullest consideration of their effect.

Nineteen hundred thirty-six is opening with renewed hope for the mineral industries. Thousands of men have been returned to their jobs, and community payrolls are again swelling. As mining prospers, so prospers the Nation, and the industries banded together under the general classification of mining are facing the new year with confidence, with renewed hope, and with a strong determination to get our national feet back on prosperity road.

Our National Payroll

DEEP CONCERN has been recently expressed, and with reason, regarding the rapidly growing national payroll of our National Government. When we consider that the administration of the Social Security Law will require more employes than the entire postal service, we have a better conception of just what these new agencies for "the more abundant life" mean in tax dollars and cents. When we also consider the fact that within two years' time we have added more than forty thousand employes to the Government's Washington force, we begin to realize that there is some cause for alarm. There are today 796,000 persons on Uncle Samuel's payroll. Of these, 605,618 are regular employes in established departments; 57,139 are employed in permanent agencies created by the present Administration; and 133,450 are employed in emergency agencies. These figures do not include the personnel of the Relief agencies or special organizations such as the C. C. C. During the World War an all-time high was reached when we had 917,750 employes on the Federal payroll.

While industry is coming back and, as a consequence, employing more and more people, the number of our unemployed still varies between 9 and 11 millions, according to who tells the story. No thoroughly accurate figures seem to be available. The Department of Commerce says more than 9 millions; the American Federation of Labor, 11 millions. Absorption of this surplus by industry is proceeding, but it is apparent that the process will be gradual. In the meantime, the Administration seems to be determined to be the world's largest employer. It is high time that Government steps out and that industry steps in. No matter which way we look at it, industry must pay the bill, if not by direct wages and employment, then by taxation to meet the Government payroll.

Congress and Taxes

CONGRESS has been somewhat like a child with a new toy. Being of practically one mind and complexion, it has had things mostly its own way and has been on a spending jamboree. More and better and bigger expenditures, more and bigger taxes have seemed to be the slogan. The words on taxation, by the President in his Message to Congress on January 3, were music to waiting ears. He advocated that Congress refrain from further tax expansion, and said he felt that any consideration of the tax question, by this session, was both "unnecessary and inexpedient." All will agree with both premises. It is, and should be, unnecessary to further tax individuals and corporations, and it is quite apparent that greater taxes are far from expedient.

We do not usually agree with Mr. Arthur Brisbane, but his recent analysis of taxation struck a sympathetic note when he pointed out: "Taxes are paid out of the

sweat of every man who labors, because they are a burden upon production, and can be paid only by production." He further points out that "this great Nation of ours has come through five economic crises * * * and it has taken longer to recover from this depression than from any of the others. * * * No such or similar colossal amounts of money were ever spent before so recklessly, so uselessly, so dangerously and so largely without effect, other than to undermine the character of the American people, * * * taxes were never so burdensome, so blighting to business, so discouraging to initiative, so destructive to enterprise."

There is no question that many agree with his conclusions and that the business of this country is thoroughly aroused. Unless Congress wishes to bring down its house upon its head, it will refrain from further spending and further taxes upon industry.

The Story of Business

THE STORY OF BUSINESS is the story of America. And business, as such, is very definitely on the defensive. It is charged that it has failed in its duty to mankind; that in the crisis through which we have passed it has failed to meet the need. It, therefore, is charged that this incompetency warrants political domination of industry.

Rarely is there an indictment to which there is not a defense. And never was an indictment made with less justification, nor greater lack of foundation. During the past year the literary world has been flooded with biographical novels, telling the great story of the development of a young country. Even a few of these books, all factual, will prove to the most skeptical that this country was founded by toil, suffering, and sacrifice; by human sympathy, and loyalty to an ideal. The last 50 years of our national development is a soul-stirring story full of achievement and glory. And "business" has written that story. If the old saying that "we are the product of our yesterdays" is true, America may be justly proud of her yesterdays and of the men who made them worth while.

Business has been silent too long. It has been too big and too busy to pay much attention to the invective of politics or other envious groups. It has hoed its row, intent only upon bigger and better rows, and has left criticism for those less occupied to answer. But business is arousing. It means that those who condemn must prove their case. It is preparing to tell the world just how our great industries have developed, and prospered, and made us the pride and envy of the world, with living standards for our lowliest workers far beyond the dreams of most other peoples.

We as individuals, as business groups, as a people, as a Nation, are far from perfect. We have failed, not once but many times, but for each failure we have many successes to our credit.

Minerals have played an interesting and important part in the development of American business. Our industries have furnished the raw materials for hundreds of enterprises, while they, themselves, have offered real reward for those who had courage, intelligence and initiative. The mining industry, therefore, is intensely interested in this American Saga. More than interested in our economic welfare; in the problems of employment and unemployment; recovery or doldrums; wise and unwise legislation; national tax programs; national debts, tariffs, and above all the proposals of those groups who would tear down that which has taken American business hundreds of years to build.

The World Silver Situation*

By FRANCIS H. BROWNELL†

FOR more than a year last past, by far the most important factor in the world silver situation has been the silver buying policy of the United States Government. There is every prospect that this will continue to be the case for some time to come. Any discussion of silver today necessarily is essentially a discussion of that policy.

Let me disclaim at the very start any knowledge or information in regard to any silver policy of the United States, past, present or future, that is not available to every student of the subject.

Congressional action particularly affecting the world silver situation may be briefly summarized as:

(1) Effectuating the agreement reached at the London Economic Conference of 1933, under which the United States practically withdraws from the world market the current United States mine production of silver.

(2) The so-called Thomas amendment to the Agricultural Act, approved May 12, 1933, which gave to the President, among other things, the power by proclamation to fix the weight of the gold dollar, and also to fix the weight of the silver dollar at a definite ratio in relation to the gold dollar.

(3) The Silver Purchase Act of 1934, parts of which are as follows:

"Sec. 2. It is hereby declared to be the policy of the United States that the proportion of silver to gold in the monetary stocks of the United States should be increased, with the ultimate objective of having and maintaining one-fourth of the monetary value of such stocks in silver.

"Sec. 3. Whenever and so long as the proportion of silver in the stocks of gold and silver of the United States is less than one-fourth of the monetary value of such stocks, the Secretary of the Treasury is authorized and directed to purchase silver, at home or abroad, for present or future delivery with any direct obligations, coin, or currency of the United States, authorized by law, or with any funds in the Treasury not otherwise appropriated, at such rates, at such times, and upon such terms and conditions as he may

deem reasonable and most advantageous to the public interest: *Provided*, That no purchase of silver shall be made hereunder at a price in excess of the monetary value thereof: *And provided further*, That no purchases of silver situated in the continental United States on May 1, 1934, shall be made hereunder at a price in excess of 50 cents a fine ounce."

Congress not only left to the Secretary of the Treasury entire discretion as to the rapidity, time, and price at which silver purchases should be effected, but it also indirectly left to the President considerable power as to the total amount of silver to be bought; for the President can, by changes in the content of either the gold or the silver dollar, radically change the ultimate amount of silver to be purchased. The amount to be purchased also increases or decreases as gold holdings of the United States increase or decrease as a result of international trade or by purchase. There could, therefore, be no determination in advance of even approximately the exact number of ounces of silver that would be purchased under the act.

What were the problems confronting the Secretary of the Treasury in the performance of his task?

First: What was the fundamental intent of the law itself? It was not, as is frequently asserted, to buy, as fast as possible, the total amount of silver, raising the price to its monetary value—\$1.29 per ounce—in order most rapidly to accomplish the purchase.

If Congress had meant a speedy immediate purchase, it would not have given the Secretary of the Treasury discretion to buy "at such rates," "at such times," and "upon such terms and conditions as he may deem reasonable and most advantageous to the public interest." This language was used by Congress, having in mind the fundamental declaration of policy in the second section of the act, that "the proportion of silver to gold in the monetary stocks should be increased with the *ultimate* objective of having and maintaining one-fourth of the monetary value of such stocks in silver." The words "ultimate objective" also must be interpreted in the light of contemporary monetary conditions.



At the time of the passage of this act, as today—17 years after the close of the World War—the various monetary systems of the world were, and are, less tied to a metal base, whether gold or silver or both, than at any time for more than 2,000 years. Excepting France, Holland, and Switzerland, no nation was or is upon a gold standard, as that term was defined up to some five years ago. The use of silver as a money in subsidiary coinage had been greatly diminished, beginning about 1920, as one country after another followed the example of Great Britain in reducing the silver content of its existing silver coins below former levels. India in 1927 adopted a system not only contemplating using less silver in the future, but also selling a large amount of silver owned by the Indian Government.

With the exception of the three gold standard countries above mentioned, all other important nations were, and are, upon a managed currency basis, using that term in a broad sense. The monetary exchanges between nations were, and are, no longer free and untrammelled, but very generally controlled by Government supervision. International trade has become partially paralyzed and reduced far below its former volume. The prevailing chaos in monetary systems is universally deplored, but the problems underlying its correction seem so many and so great as to be unsolvable for some time. Yet few believe that they can never be solved, and most, if not all, statesmen, economists, and business men alike look forward with confidence to the arrival of the day when the principal nations will develop monetary systems better fitted to serve international, as well as internal, trade. Congress entertained this view and,

* An address delivered before The American Mining Congress at Chicago, September 24, 1935.
† Chairman of Board of Directors of American Smelting and Refining Company, New York City.

therefore, authorized the Silver Purchase Act to be carried out by the Secretary of the Treasury in a manner best calculated to further such ultimate objective. We commonly refer to this latter condition as "Stabilization" and generally expect it to be one of three possibilities:

- (1) Some type of gold standard;
- (2) Some type of bimetalism, using both gold and silver; or
- (3) Some type of "managed currency," possibly like that of Great Britain and so-called "Sterlingaria" today, but more probably using both gold and silver to some compulsory extent.

The practical effect of the Silver Purchase Act and of the other actions above described is to throw the influence of the United States towards a further use of silver, either ultimate bimetalism in some form or the compulsory use of silver as well as gold if a managed currency is ultimately adopted. Conferring discretion on the Secretary of the Treasury to carry out the act "on such terms and conditions as he may deem reasonable and most advantageous to the public interest" indicates that Congress had in mind that the Secretary should so carry out the terms of the act as to further, rather than to hinder, the ultimate use of silver as well as gold by the world when currencies are restabilized. Congress would not have embarked on the policy of buying so much silver, by far the greater part of which must come from outside the United States, if it had not believed that this would ultimately influence other nations to follow a similar course. It could not have contemplated that the act should be so enforced as to induce other nations to melt their silver currencies and sell the resultant silver to the United States. This, obviously, would leave the United States the holder of most of the silver now owned by other nations and would hurt, rather than help, from every standpoint.

Second: What were the sources from which the silver, to be purchased under the act, could be obtained? Obviously, it could be from only four:

The first source was the floating supply of silver in the principal markets of the world. By "floating supply" is meant silver not in fabricated or coinage form, but principally in the hands of speculators in the chief silver markets of the world—New York, London, Bombay, and Shanghai. This amount was estimated by the trade to be somewhere around 400 to 500 million ounces, and now has been largely purchased by the United States. Probably not over 200 million available ounces remain unpurchased.

The second source is current mine production. This was a little over 185 million ounces in 1934. It probably will be somewhat higher in the current year, but is not likely to exceed 200 million ounces. About 75 percent of silver produced is a by-product of lead, copper, and zinc production. The peak produc-

tion of all time for silver was 262 million ounces in 1929, which year also saw substantially the peak production of copper, lead, and zinc as well. An average of 225 million ounces per annum over the next five years is probably all that will be realized. Silver used in the arts (that is, for other than monetary purposes) will require approximately 75 million ounces per annum, leaving approximately an average of 150 million ounces per annum from current mine production available for monetary purposes. To mine production should be added the 30 million ounces of silver per annum which the Indian Government under the London Economic Agreement can still sell. Assuming, then, the average current mine production at 225 million ounces, deducting 75 million for industry, and adding the 30 million from India, we would have an average of 180 million ounces per annum available for sale, without drawing upon the sources of either fabricated silver or coined silver. The total in five years would be 900 million ounces. To this must be added, say, 200 million ounces of floating silver still upon the world exchanges; so that we would have available something around 1,100,000,000 ounces available for purchase in the five years, without drawing upon the sources of coined silver or fabricated silver. While no accurate information is available, it seems probable that remaining buying capacity under the Silver Purchase Act is not much above this figure, if we assume no further change in the content of either the gold or silver dollar and no increase or decrease in present gold stocks. We may thus roughly figure that, if the Treasury Department pursues its present policy, it will be able to take the surplus output of current mine production for at least five years. There would thus be five years in which restabilization of currencies may occur, with its ultimate decision as to the future of both gold and silver.

The third source of possible supply is silver already coined in the currencies in the various nations of the world. Excluding the United States and China, the amount of this silver is estimated at about 1½ billion ounces.

The fourth source of possible supply is fabricated silver of all sorts, including the hoards of India and China, which are largely in fabricated shape. No even approximately accurate estimate of the volume of this silver can be made, but it seems quite probable that it is not less than 5 billion ounces and that around 7 to 8 billion ounces is nearer the truth.

Since the fundamental purpose of Congress is to further the long-run utilization of silver as a monetary metal reserve, rather than merely to have the Secretary of the Treasury buy silver as rapidly as possible until the ratio of 1 to 3 is established and then stop regardless of consequences, it is obvious that silver from sources of coined silver and fabricated forms should not be purchased extensively. To melt existing

coinage is to decrease the use of silver and to decrease the number of nations interested in the restoration of silver as a monetary metal, and hence to decrease the value of United States holdings. To decrease the amount of silver now in fabricated form serves no good purpose at present. It is better where it is, since it affords a reservoir which can be drawn on by other nations as they increase their use of silver, and can be resorted to by the United States whenever it seems desirable and in the public interest. Moreover, if, by drawing on this class of silver, the United States should exhaust its buying power before a general restabilization of world moneys, the price of silver would at once fall rapidly and the prospects of silver in restabilization would be greatly decreased. A purchasing policy that will afford a steady market at a steady price for world mine production of silver is best also both for the mines and for the countries in which they are situated. Also, the apparent experience of the Government during its recent buying program was that very little silver is available on an advancing market, for the speculators, sensing a continued advance, daily bid just slightly higher than the Government price, and thereby keep a step ahead of the Government buyer, until something approximating the limit is reached. The probability, therefore, is that the Government would be obliged to pay the limit of \$1.29 to cover its remaining purchases, if it wished to complete them in a short time. If the United States should raise the price to the limit, it would exhaust its buying capacity very rapidly, and probably long before any restabilization of monetary systems. The price of silver would soar like a rocket, explode and fall like a rocket remnant. Congress could have intended no such calamity.

Let us now consider what took place in carrying out the buying under the provisions of the act. First, the silver holdings in the United States were nationalized, and the silver in the United States purchased for not over 50 cents per ounce, as prescribed by the act. Contemporaneously, silver on the foreign exchanges was bought as rapidly as offered, at or below that level. United States citizens were by law effectively prohibited from speculating in silver, by means of a 50 percent tax on any profits made. But this did not, of course, affect speculation by citizens of other countries. The purchase of the United States stock and inroads upon the floating supply of silver on foreign exchanges, especially that of London, caused foreign speculators to drive up the price with great rapidity. The Treasury followed the rise evidently reluctantly. But toward the level of 60 cents per ounce, repercussions in other nations began to appear. China protested loudly and vigorously. Its silver was leaving it. Whether in the long run China will or will not benefit from a higher price of silver, there seems little doubt that the process of going from approximately 40

cents per ounce to 60 cents per ounce in a few months, and in a few months more to 80 cents per ounce, had an extremely deflationary immediate effect on a silver standard country. Several banks failed. The silver coinage of China began to be shipped to the United States in great quantities. Vacant capacity of American refineries was filled with newly minted Chinese dollars, to be refined to pure silver and sold to the United States. It is estimated that over 200 million of new Chinese dollars were exported. China was driven to place a ban upon the exportation of silver and compelled to control its exchange artificially.

The next striking effect of the rapid rise in price appeared, curiously enough, in Mexico, the largest silver producing nation in the world, and hence presumably most interested in the long-run welfare of silver. Mexico had outstanding only silver coinage. It had in practice, through Government control, effectively stabilized its peso at 3.6 Mexican pesos to the American dollar. It believed this level most advantageous in the Mexican economy. At this exchange level, the melting point of the Mexican peso was approximately 72 cents. When this price was surpassed, the Mexican Government acted with great rapidity. It at once called in all outstanding silver pesos and began printing paper money in lieu thereof, holding the retired silver coinage as backing for the paper. It also authorized new coins of a reduced silver content, but so far has not issued any, except subsidiary 50 centavos, apparently hoping to avoid doing so if the future price of silver does not make it necessary.

Representatives of the Mexican Government flew to Washington. Conferences were had with our Treasury Department. The newspapers announced that both sides were pleased with the result. From then on, the United States ceased to follow up the price of silver, but left the market to itself, buying only as the level fell. Since August 24, it has not bought except as silver is offered at not over 65% cents.

The following table, taken from the *Analyst* of July 5, 1935, shows the silver coinage of various countries and the bullion parity price in United States money, beginning at 59 cents.

This table shows approximately enough silver in the coinages of the countries named (China and the United States omitted) to fill the remaining buying capacity of the United States, and all these coinages could be melted and sold at a profit at \$1.29 per ounce.

The foregoing table and actual experience of the last year indicate that around 65 cents should be the high level of United States purchasing, and that around 60 cents is a more desirable level at present. It may be asked—Why? And if so, why 60 cents and not 55 cents, or even 50 cents? The reasons are:

(1) Sixty-five cents may be too near

* Computed from Annual Report of Director of Mint for 1934, page 91.

SILVER COINAGE IN RELATION TO THE RISING PRICE OF SILVER

Country	Name	Monetary unit	Fine content per monetary unit in grains	Silver coins		Quantity, millions of fine ounces
		Approximate current exchange value in U. S. dollars		Bullion parity, price per ounce in U. S. dollars		
(1)	(2)	(3)	(4)	(5)	(6)	
Peru.....	Sol	.24	192.9	.59	7.	
Mexico.....	Peso	.28	185.2	.72	78.	
Colombia.....	Peso	.53	347.2	.73	8.	
Ecuador.....	Sucre	.095	55.6	.82	.6	
Greece.....	Drachma	.0093	5.40	.83	3.	
			4.37	1.02		
Spain.....	Peseta	.136	69.4	.94	144.	
			64.4	1.01		
Philippines.....	Peso	.50	246.9	.97	19.	
			231.5	1.04		
Nicaragua.....	Cordoba	.71	347.2	.98	.2	
			308.6	1.10		
Siam.....	Baht	.45	208.3	1.04	19.	
			150.0	1.44		
India.....	Rupee	.37	165.0	1.08	970.	
Indo-China.....	Piastre	.66	283.3	1.12	21.	
			277.8	1.14		
Australia.....	Pound	3.92	1,614.5	1.17	14.	
Japan.....	Yen	.29	110.0	1.26	107.	

(Total, 1,390,800,000 oz.)

COMPUTATION OF BULLION PARITY

The bullion parity in dollars per fine ounce is the product of the exchange rate in dollars per monetary unit (column 3) times 480 (the number of grains in a troy ounce), divided by the fine content, in grains, of the silver coins per monetary unit (column 4). To find the price per ounce, .999 fine, the standard for quotations in the New York market, this result should be multiplied by .999, but this is not necessary if, as here, fractions of a cent are neglected. For example:

$$\begin{aligned} \text{Exchange rate of Mexican peso is } 28 \text{ cents.} \\ \text{Fine silver content is } 185.2 \text{ grains per peso.} \\ \text{Bullion parity} = \frac{480 \times .28}{185.2} = \$7.2 \text{ per ounce.} \end{aligned}$$

the melting point at which some nations in dire need of money may be tempted to melt their coinages, even below the melting point, or bullion parity, substituting paper or some cheap alloy in place of silver, and thus realizing an apparent profit, as well as obtaining United States money for the entire amount.

(2) Sixty-five cents may be also a bit too tempting to holders of fabricated silver, especially those in want, or having little confidence in the future of silver.

(3) China would probably be helped, for the time being, by a price of silver about the average of the past, until it can readjust itself from former abnormally low levels. At such level, it is less likely to join "Sterlingaria."

The average price of silver for the 40-year period, 1894 to 1933 (both inclusive), which includes the high prices due to the World War and the very low prices due to the present depression, was 61.5 cents.*

The average price of silver from the year 1894 until the war began to affect the price in 1916 was 59.6 cents.* After the war and the termination of the Pittman Act, for the five years, 1925-1929 (both inclusive), the average price was 60.06 cents.* Thus, the history of the past indicates that 60 cents an ounce is substantially the average price of silver when unaffected by war or by extreme depression. Any price below that level may be said, therefore, to be an abnormally low price.

(4) A price of 60 cents would better favor the fabricating silver interests of the United States. The source of supply for our fabricating plants must be that of foreign origin, since while the London pact remains in effect, the United States price will probably be more than the foreign price. In the fabricating business, the carrying of silver for a long period of time is a necessity. The fabricated market is accustomed to a price of silver around 60 cents, which has been the average, as shown above. To increase above that level seems to tend to diminish the use of sterling silver and to increase the use of substitutes, especially of plated silverware.

(5) A fall in price below 60 cents would be too drastic, now that higher levels have been reached. Stability of price is of the greatest importance to the future of silver.

The long-run welfare of silver, the furtherance of its increased use when currencies are restabilized, the maintenance of present silver coinages in countries still using some silver, the desirability of holding fabricated silver in its present form, and the best interests of silver production in foreign countries and hence of the countries themselves—all indicate that, until the monetary chaos now existing has been further clarified, it is desirable for the United States to devote its buying power to maintaining the price of foreign silver at not less than 60 cents per ounce, nor more than about 65 cents, rather than



to go higher and thus create further confusion in other countries and other monetary systems, cause melting of coins and fabricated silver, and thus exhaust its buying capacity before restabilization occurs. A price of 60 to 65 cents per ounce would limit purchases to current mine production in excess of the requirements of industry and to the loose stock still in the hands of foreign speculators. Whenever the price exceeds the level offered by the Treasury, outside demands will shortly satisfy themselves at some slight advance, and the price then drop back to that offered by the United States. If this price level is maintained, it seems probable that the currencies of the world will be stabilized before the United States exhausts its silver buying power. Restabilization will definitely determine the future of both gold and silver, and if the price of silver remains substantially steady and not subject to wide fluctuations, the further probability of greater utilization of silver by other nations will be decidedly enhanced, for the principal arguments against silver is based upon its alleged instability of price. The United States already owns more silver than any other government, and its own interests will be thus subserved. Also, what reason today justifies the United States in paying \$1.29 per ounce when there is good reason to believe it may buy most, if not all, its requirements at half that price and can raise the price at any time speedier buying seems desirable?

In conducting its actual buying, the Treasury Department has acted fully in accordance with the fundamental intent of the law, so as not to impair the chances of a greater use of silver when currencies are restabilized, and so as not to increase the monetary chaos already in existence. It has proceeded cautiously and conservatively, feeling out the results of various types of buying; properly trying to secure as much as possible at low levels; resisting the foreign speculators, who rapidly pushed up the price; and remembering that too high a price would defeat the very objects of the act itself.

All those connected with the normal silver business, excluding speculative activities, must gratefully appreciate the care, the sympathy, and the wisdom with which the Secretary of the Treasury has performed his duty under the Silver Purchase Act. While obviously seeking to carry out the purpose of that

act in loyal obedience to its fundamental intent and purpose, he has carefully sought to avoid inflicting any unnecessary and unintended burden on any legitimate business connected with silver in the United States. He has been sailing an uncharted sea full of hidden and unknown risks. He has not hesitated to change the course at once when danger appeared. The Secretary of the Treasury and his assistants are entitled to the highest praise for the manner in which the duty imposed under the Silver Purchase Act has been performed.

So far, this paper has been confined to the silver buying policy of the United States in the foreign market. Nothing I have said applies in any way to the purchase of the United States production proper. This amounts to around 25 to 30 million ounces per annum. Under the agreement following the London Economic Conference in 1933, the United States, in effect, withdrew its current mine production from the world market. To do so, it pays a higher price than the world market for United States production, and can pay any price that it sees fit, without affecting the world market. In fixing the price for silver currently mined in the United States, the Government is, and should be, governed by entirely different principles from those applied to the purchase of foreign silver.

In the United States, the present fundamental object is to bring about reemployment and to reduce the enormous expense to which the Government is put to support those who are unable to secure work. The higher price of silver has enabled many a mine to operate which could not otherwise have done so, and so has prevented many a mining community from becoming a Government charge. It has been, directly and indirectly, an important factor in such business activity as the Rocky Mountain States of this country have experienced of late. The Government is at present paying for newly mined United States silver, 77 cents per ounce. It is making a seigniorage profit of about 52 cents per ounce less minting cost, since its money value when coined is \$1.29 per ounce. This profit can be said to be available for general Government purposes, including its unemployment relief. In the industrial centers of the country, the Government is spending large sums to promote work and to bring about enlarged activity of industries. In agricultural sections, the Government is spending large sums to raise the price of agricultural products. Why should not the Government pay a higher price for silver, which helps lead, copper, and zinc mines, as well as silver mines, in order to offer work, in order to support mining communities, in order to prevent all the evils which come from a lessening of our mining activity? Careful consideration of this subject should convince any reasonable man that the present price, and even a higher price, for United States newly mined silver is fully justified.

In conclusion, perhaps a few words as to the long-run prospect of silver is in order. Should the Treasury Department retain its present policy in regard to the purchase of foreign silver and its present policy in regard to the purchase of United States silver, we can, unless unexpected conditions arise, reasonably anticipate pretty steady price levels for silver for the next several years. But the long-run status of silver will be dependent upon its enlarged use as money when world monetary systems are stabilized. The experience of the last few years has demonstrated that the quantity of gold is insufficient to reestablish it as the *only* monetary metal, not to mention the serious problems connected with the maldistribution of such stores of gold as are already in existence. The present tendency of probability is increasingly towards a greater use of silver for monetary purposes. The long-run future of silver is brighter and more promising today than at any time within the last 15 years.

● WITH THE DECLARATION of a 50-cent-a-share dividend this week the Sunshine Mining Company reached a new high in dividend records that have increased each quarter this year. Payment of \$750,000, December 30. The forthcoming disbursement will increase the total payments for the year to \$2,100,000 or at the rate of \$1.40 a share, and the grand total to \$4,525,034, all paid from the production of silver and a minor quantity of lead. In March, the declaration was of 20 cents; June 1, 30 cents; September 4, 40 cents, and at present, 50 cents. The number of shares issued is slightly less than 1,500,000. The earnings of the Sunshine were estimated by a broker last month at \$400,000 a month, exclusive of income tax, but the company has made no statement. The sinking of a four-compartment shaft proceeds. It will make possible a large increase in production when its objective, the 4,000-ft. depth, is attained.

● THE DECISION of Federal Judge Merrill Otis in Kansas City, Mo., holding the Wagner Labor Relations Act unconstitutional and granting an injunction against its enforcement by the National Labor Relations Board is the first major test case of the Act in which the decision directly rules upon constitutionality.

Correction

● THE MINING CONGRESS JOURNAL in reporting an item in our December, 1935 issue, stated that at a banquet of the Coal Mining Institute of America, certain officials including operators and mine workers officials had cooperated in the program. This was an error. The banquet was under the auspices of the Pittsburgh Coal Mining Institute.

Trend of Ore Treatment and its Bearing on LAKE SUPERIOR IRON ORE RESERVES*

By CARL ZAPFFE†

INTRODUCTION

WE MAY benefit from a review of the progress made in treating ore-material of the Lake Superior iron ore region because we shall observe a trend that now signifies much with respect to extending the life of the ore reserves. Time was when a treatment process was studied primarily for adoption because of the bearing it had on facilitating the extraction of the direct-shipping ore on a specific property. That is still an important reason but no longer is it the only one or even the principal one. Such big strides have been made in processing ore-materials that ore-treatment and the life of ore reserves have become correlatives. The year 1934 was the 80th year of ore shipments from the Lake Superior region. From personal experience I can not discourse about things that transpired during the first 50 years, but treating ore-material in a large way begins with as recent a year as 1907 and enables me to present a full review of the practice. Prior to 1907 a trifling quantity of ore was crushed and now and then a little had been dried; presumably other practices may claim such priority, but quantitatively none of these were of consequence.

STATISTICS

From Mining Directory of Minnesota,¹ a booklet published by School of Mines Experiment Station, University of Minnesota, we obtain statistics on shipments of treated ore of that State. In a certain tabulation this book shows "Crushed and/or Screened" (ore) as one heading, all other treated ores are listed under the heading "Concentrated" (ore) and the two constitute "Total Beneficiated" (ore).

*An address before the American Mining Congress at Chicago, September 25, 1935.

†Manager, Iron Ore Properties, Northern Pacific Railway Co., Brainerd, Minn.

¹1934 Ed., p. 198.

²Lake Sup. Iron Ore Assoc. Annual Reports.

The first shipment of concentrated ore is recorded having been made in 1907 and amounted to 9,816 tons. In 1910 the shipment jumped to 610,392 tons. The maximum shipment was in 1923, being 7,612,458 tons. Between 1920 and 1930 inclusive the annual shipments were of fairly uniform amount and averaged 5.7 million tons per year.

Crushed and/or screened ore amounted to 146,503 tons in 1906. Crushing was used before 1906, but only twice up to 1917 did the total so treated reach 200,000 tons. In 1923 it exceeded one million tons. Between 1925 and 1930 inclusive the amount averaged 8.5 million tons per year.

Combining all treatment methods to represent the total beneficiated ore, we see barely 100,000 tons shipped per annum prior to 1910, but 2 million in 1911. For the period 1925 to 1930 inclusive the average annual shipment was 14.5 million tons.

Summarizing, we see then that:

- (1) Not until 1910 did the tonnage of beneficiated ore become an important factor.
- (2) Since 1924 the percentage of treated ore dropped but once below 30 percent and once it exceeded 40 percent.
- (3) Since 1924, to 1934, the treated ores have constituted 34.9 percent of the total of all ores shipped.
- (4) The percentage and the total tonnage of beneficiated ores are still on the rise.

For the Michigan districts² crushed-ore tonnage has reached almost 7 million tons per year or 2/5ths of the output of that State.

The maximum total of Lake Superior ore treated in any one year occurred in 1929; it amounted to 22,939,761 tons and comprised 34.8 percent of all ores shipped from the region in that year.

In 1930 the tonnage shipped, though smaller than in 1929, produced a percentage of 38.9, but generally the total for the entire region amounts now to a little over 34 percent.

ORE TREATMENT

Because ore treatment has been developed extensively in the Mesabi District, it is desirable to comment first on a few pertinent features of this district to indicate how ore treatment came to be started. The district is marked by a continuous band of iron-bearing formation of a length of about 120 miles. It may be divided into an eastern, a middle and a western section, based on characteristics of the ores. The middle section contains the best ore, the most proven ore and the most mines. From that standpoint the eastern section may be regarded the poorest section; but it is especially distinctive because at its extreme eastern end the ore consists wholly of the mineral magnetite. When ore was first disclosed in the western section this portion did not appear attractive because so much of the ore was associated with partly concentrated formation and with decomposed chert resembling sand; but the tonnage was exceptionally large, and inasmuch as pit mining was feasible great impetus was given to endeavors to improve the iron-content by treating the mine product to eliminate the undesirable sandy material. This western section became at once experimental ground. A suitable washing-plant was evolved and ever since then this western section has been known as the area of "wash-ores." Whatever may be meant by the term "standard" wash-ore, which term is used frequently, is to be found in the material to which the practice was first applied. The first permanent washing plant built is still in operation and marks to this day the most westerly of treatment plants in the whole district.

This development in treating ores of the western section had for a time the effect of marking this type of treatment as the only applicable type. Milling practice has, however, little regard for artificial boundaries and in time washing was extended to mining operations further east in the Mesabi District and is now practiced along the entire dis-

tance. Also, personal prejudice was not to rule forever; we see that the adopted treatment practices have become numerous, and they are so varied that each mine and each deposit becomes a problem by itself. Whatever is needed and whatever is applicable is done. It has resulted in many interesting combinations of equipment and procedures.

Washing iron ores was not a new process in 1905. It had been done for many years in other States and in the Mesabi district experimental work had been conducted before 1903 by Charles A. Purdon and W. A. Barrows, Jr.,³ at the Arcturus property, and in 1904 an attempt was made by others on a nearby parcel. It was then evident that washing could be done but the task was to handle large quantities. In 1905 Oliver Iron Mining Co. undertook to solve the problem of handling them on a large scale. This resulted in building a large operating plant in 1909-1910 on the shore of Trout Lake, near Coleraine and Bovey, Minn. The concentrates made in the experimental plant were shipped in 1908 and 1909, and from the completed plant shipment was started in 1910. Nearly everything in the Lake region pertaining to ore-treatment, as an established and continuing practice, begins with the completion of this plant. It is a huge structure and was designed to handle 30,000 to 35,000 tons of crude ore per day of two 10-hour shifts.⁴ The crude ore material ranged from 35 to 50 percent in iron and the concentrates contained from 58 to 62 percent. Tonnage recovery was around 65 percent. The plant consisted of five units and each unit consisted essentially of log washers, turbos and tables, designed to remove silica which occurred naturally as loose grains. This at once became the typical washing-plant; and because this operator was the largest mine operator in the Mesabi District, the strongest company financially and possessed of the largest ore reserves the prevailing view of the time was that all these conditions had to be met if the practice of washing iron ores was to be extended. Furthermore, it was believed that improvement of ore-material would be confined to material in which the silica was naturally in a loose condition or easily loosened by abrasive screening. The term concentration was adopted to designate this practice, and the practice was deemed applicable to only western Mesabi properties.

Instead of being final, this proved to be but the entering wedge. In a few years it was recognized that treatment could be extended to other properties and that this type of plant need not be copied. Variations in flow sheets and mechanical appliances were developed and smaller plants were built by other operators. With these introductions the field for ore-treatment was successively



Stripping Molds from Steel Ingots

widened, within the range of reasonable cost, to enable improving certain borderline ores not strictly wash-ores. Then followed the need of a term other than concentrating and the word beneficiation crept into use.

Treatment processes were not long confined to raising iron-content by removing loose silica-sand when attack became centered on making loose particles of the siliceous material attached to particles of iron oxide. This has led to using various methods and combinations of crushing and screening, and both of these steps have also been adopted as a single method of improving ores.

Improving physical properties eventually became as urgent as improving chemical composition, and then a combination of suitable sizes and desirable chemical composition had to be achieved. Ore handling and furnace practices experienced changes. Single mines gradually became parts of groups. Operating and consuming companies became affiliated if not merged. Some mines had to be exhausted rapidly due to lease terms. The location of an ore-consumer's furnaces and mills, the coal and coke that he used, the products that he made, all these and other related features influenced and determined what should be done to the mine product. A growing appreciation of the need of absorbing less desirable ore with the available better ores expedited the practice of intricate mixing to make group-ores. Every kind of a product is put into such groups. Consequently, today we can no longer distinguish too finely between separate processes and proceedings. There is an over-lapping all along the line, in which each and every step plays an essential part. We have reached the

stage when we should use a broader term than beneficiation. A most suitable term is ore-treatment.

As each new method of ore-treatment has been proposed, men of the industry have retorted: "If it pays"; indirectly thereby expressing their doubt about the worth of its adoption. Nearly always a newly proposed treatment has found adoption. The answer must be that it pays. In this review we may, therefore, disregard cost and instead emphasize what can be and has been accomplished by each process and give heed to the effect.

RESUME OF PROCESSES

The Minnesota School of Mines Directory⁵ shows a tabulation entitled: "List of Beneficiation Plants on the Minnesota Iron Ranges." One column of the tabulation is headed "Type of Plant." The types of plants therein listed and the number of each are:

Washing Plant	18
Crushing Plant	5
Screening Plant	4
Crushing and Screening	5
Crushing and Washing	3
Drying Plant	1
Crushing and Drying	1
Washing and Jigging	2
Sintering Plant	1
Washing; Screening and Sintering	1
Magnetic Concentration	1
Total	42

To this list may be added a new plant, to be designated Roasting and Magnetic Separation, and another washing plant now being erected, and one of

³ Personal communication.

⁴ Sebenius, J. U.: Wash Ores of the Western Mesabi Range and the Coleraine Concentrating Plant: Proc. Lake Sup. Min. Inst., 18:155-86, 1913.

⁵ 1934 Ed., pp. 196-197.

the plants listed under Crushing and Washing should show also Flotation.

In the Michigan districts⁶ crushing is done at 20 mines and crushing-and-screening at one mine.

There being approximately 160 ore-producing units in the Lake region, 65 of them, or 40 percent, treat their ores.

We have, therefore, 13 types of plants in 65 installations. Of the total installations 19 use the typical washing method, but 24, or 37 percent of the total, are based on the use of water as the agency for removal of silica. In nearly all plants crushing and/or screening is a part of the procedure. To gain a clearer insight in the reason for the expansion of practices and their applicability, the various methods will next be briefly outlined.

WASHING

In washing, the main purpose is to remove loose and light undesirable minerals by using flowing water. All the devices used are founded on flushing these undesirables out of the ore material. The material removed is preponderantly quartz (silica) in the form of decomposed chert. The heavy particles of iron oxides, down to a certain size, remain.

The method yields a product which is very high in iron. It involves a large loss in iron units and tonnage but it is a cheap method. It is amenable to wide variations in equipment to make it suitable to the peculiarities of ore deposits of any property having wash-ore to treat.⁷ Due to recognizing physical differences in ore particles, the improvements made since 1910 have been in the more expeditious treatment of very large tonnages, in the reduction of losses, and in the development of complete mechanical units for use on properties having only very small quantities of ore material amenable to treatment by washing. A single machine has been developed that contains all the essentials of a large plant and may be used also as a portable plant.⁸

In many instances wash-ore occurs at depths which require removal by underground mining. Underground wash-ore has been deemed valueless because too costly to produce. Up to 1934 all wash-ore was obtained from pit mines, but in that year an inroad was made on even such material at one mine where conditions developed favorably to taking it.

Washing has been extended to a point where we can no longer justify the exclusion of any wash-ore from consideration. No batch of wash-ore is any longer immune to attack. The ponderousness of the first plant built served as a challenge and now washing has spread the full length of the Mesabi

District, has been adapted to many kinds of properties, and has been made to fit the small as well as the large pocketbook.

JIGGING

Jigging is a process using water in a container providing a pulsating motion. Jigging machines can be built to do what washing-plant machines will do, but the effectiveness of a jigging machine lies in being able to remove larger particles of impurities. Having succeeded in washing out fine loose silica, the next step naturally became handling coarser sizes, and by crushing make free silica-particles from lumps attached to pieces of iron oxide. It is possible to treat such ores by jigging if the difference in specific gravity between the crushed particles is sufficient and if the porosity or density is adequate. Texture and character of particles have a most important bearing in this type of treatment. The recovery is not as high as is achieved in a washing plant. A jigged product has a very desirable physical character.

When jigging was first contemplated, jigging machines used in other fields were deemed unsuitable for treating Lake iron ores. Jigging was first tried in the Cuyuna District, in 1914, but pressure attendant upon war conditions necessitated relaxing on the experimental work. Up to 1924 all attempts at jigging produced insufficient favorable results, but in that year jigs came to be built which worked suitably on a certain Mesabi ore, and then on a Cuyuna ore, and there jigs were continued in use until those mines were abandoned. These two experiences broke the resistance to using jigs.

Some ore-materials must first be crushed to break up the bond between iron oxide and chert, but thereby still does not produce a wash-ore; or, a mass of ore-material when crushed and screened becomes partly a wash-ore and partly a jig-ore. Because of that, jigging units may be added in a washing plant and treat those parts of a plant flow which will produce the desired results. That is the stage of development in which jigging now is. We may expect to see jigging stand by itself because during the past three years the Mines Experiment Station of the State University has made an extensive survey of the Mesabi ore formation and has disclosed an immense tonnage of material which is suitable for treatment by jigs.

The typical jigging apparatus consists of a long box divided into compartments, with the poorer material made to move over the top of the bed from one to the next compartment while the better material in each compartment drops to the bottom where it can be drawn off; but we can see in operation a new type of machine which consists of a series of overhead launders equipped with baffle plates and using flowing water. It is known by the name of Rheolaveur.⁹ This type is an innovation. It was in-

stalled in 1930 and has been used effectively ever since. It is of further value because it has led to introducing other new work in ore-treatment, to be described subsequently.

CRUSHING AND SCREENING

Uniformity of the physical character of ore sent to market has become mandatory. Ore that is too coarse or too fine can not be left unmined. Uniformity is achieved by crushing and screening, and is supplemented by the manner in which loaded ore cars are dumped into the pockets of the ore-loading docks. More and more does ore of a single mine not go to market as such but as part of a mixture. As many as 10 or more mines have contributed ore to a single mixture. The product of a single mine may become distributed and be found in several separate grades of ore. Into these mixtures go also the products of ore-treating plants. This procedure is termed grading. Grading is carried out with amazing skill and accuracy.

Grading ore is a refinement in the category of ore-treatment, and crushing and/or screening is a means of facilitating grading. Sometimes crushing by itself develops a uniformity of composition as between car-load lots not otherwise obtainable. Screening also eliminates fines and waste and thereby improves the chemical composition. In either case the final product is better than it was originally. The tonnage so treated has grown to big amounts since 1924.

DRYING

Ore contains two kinds of water. The one is water of crystallization and the other is atmospheric moisture. The latter is held physically and can be eliminated by heating ore to a low temperature whereas the former can be eliminated only by heating to a very high temperature. In the trade atmospheric water is called "moisture-content." Given a certain weight of ore, the more of moisture it contains the less of iron it has. Some ores contain so much moisture that the iron-content is too low to enable marketing the ore. That suggests heating the ore to drive off this moisture. The procedure is to pass the ore through a moderately-heated furnace, usually a rotary kiln.

It is inadvisable to take out too much of the moisture because that makes ore dusty and leads to loss of ore during transportation and by the blast used in the reduction furnace. One is apt to think of drying being done to obviate paying freight on water, but invariably an ore subjected to drying is so treated to raise the iron-content to a marketable grade. Such ores must be fairly low in silica and alumina because removal of moisture raises the percentages of these just as it raises the percentage of iron.

Drying was initiated in the region fully 40 years ago but only in later years has it been used continuously at some mines. While not many attempts have been made to introduce drying

⁶ Lake Sup. Iron Ore Assoc., W. L. Tinker, Sec'y.; personal communication.

⁷ Mahon, S. A., and Counselman, T. B.: Developments in Washing Mesabi Iron Ores: Proc. Lake Sup. Min. Inst., 28:39-51, 1930.

⁸ Davis, E. W.: A New Machine for Concentrating Minnesota Wash Ores: Univ. Minn. Mines Exp. Sta. Bull. No. 6, 1919.

⁹ Wallie, M. P.: The Rheolaveur Method of Ore Beneficiation: Proc. Lake Sup. Min. Inst., 28:67-74, 1930.

plants, the worth of drying has provided the incentive to studies leading to the use of higher temperatures for other processes.

SINTERING

When Mesabi ores were first offered for sale serious objection was made because of their natural fineness. In some methods of ore-treatment fine-grinding is an essential step, and thereby we make sizes which users of ore seek to avoid. Fine sizes must be overcome. It is accomplished at some furnace plants by screening ores to sizes and charging the furnace by sizes; but in the main fines must be converted into lumps and that is the prime objective in sintering, whether the fines occur naturally or are the result of mechanical manipulations. Sintering at the mines is an innovation of the last decade. Some ore consumers sinter fines at their furnaces. As a whole the practice of sintering is spreading.

Sintering requires a degree of heat which melts the surface of ore particles to the stage of stickiness. Upon removal of the heated bed of ore from the flame, cooling sets in and the original fine particles adhere to each other and become lumps of very cellular material. There are no dust losses such as occur with ore dried at lower temperatures in rotary kilns. Because sinter has a highly desirable physical structure, a growing recognition has developed in blast furnace practice that sintered ore has benefits over unsintered ore.

Some ores contain much atmospheric water (moisture) and/or much volatile matter (loss by ignition). As a result such ores often have a content of iron which is too low to enable being marketed profitably. Drying in kilns would drive off part of the moisture but might not accomplish sufficient gains in the iron-content. Again, these ores might be of fine size and need agglomerating. This is a combination of conditions which favors adopting sintering to make lumpy ore from natural fines, and in doing so all the water and volatile substances are driven off incidentally and thereby the iron-content is raised to an amount which makes the sintered product valuable for its iron-content as well as desirable for its physical structure.

At one open-pit mine in the Cuyuna District sintering was introduced in 1924¹⁰ because a large tonnage of ore was high in both moisture and loss by ignition and also had a fine texture. But for the powdery condition of this ore, kiln-drying might have sufficed. Following that a plant was built in the Mesabi District to sinter ore that was high in moisture and had also physical short-

comings. Both plants have operated continuously since erected. A third sintering plant, but it was the first of the three to be built, was used to agglomerate manufactured fines resulting from magnetic concentration; it has been idle several years because mining was there discontinued.

SINTER-DRIED

This expression was coined three years ago to describe a type of dried lumpy ore. The drying is accomplished by using not a kiln, as previously described under *Drying*, but by mixing the ore in railroad cars with hot sinter as it emerges from a sintering plant. The product becomes a mixture of natural lumpy ore and sinter.

To obtain the best results in sintering, the crude ore must be crushed, screened and sized. If lumpy ore has a high moisture-content, although it is usually less than the associated fine ore has, a reduction in moisture and a gain in iron can be easily achieved at virtually no cost if in the initial preparation for sintering, the lumps of crude ore are screened out of the mine-product and dumped into ore cars which contain newly made sinter. The heat radiated by the cooling sinter dries the lumpy ore. This mixture of sinter and ore is termed "sinter-dried" ore.

It is manifest that this method of improving lumpy ore, even as the making and shipping of sinter, could not have been introduced until the ore cars and the ore docks of the carriers were no longer made of wood. While virtually all ore cars now in use are made of steel, some of the ore docks are still made of wood.

MAGNETIC SEPARATION

Minerals possessing magnetic properties can be separated from associated gangue by passing the ore over electromagnets. It is the oldest form of iron-ore treatment applied extensively in the United States but has been used very little in the Lake region.

The iron-bearing mineral to which this process is particularly adapted is the mineral magnetite. The extreme east portion of the Mesabi District has an abundance of it and about 15 years ago a magnetic separation plant was built there.¹¹ It is known as the Babbitt plant. It constitutes a very valuable contribution to ore-treatment because it shows what can be accomplished with the type of material characterizing the extreme east section of the Mesabi District just as the Trout Lake washing plant did for the type of material characterizing the extreme west end.

The rock is crushed to fine size to free the magnetite from the associated minerals, wherefore the ore-product of the mill has to be sintered to create lumpy ore. Up to three tons of ore material was required to make one ton of shippable ore, containing from 63 to 65 percent in iron, 8 to 10 percent silica and with phosphorus always un-

der .030 percent and as low as .008 percent. The first shipment of ore was made late in 1918. Even though so good a product was made, there was then no need for additional tonnage of ore reserves and the work was discontinued, temporarily as then believed.

Such a plant can contribute heavily to the tonnage of ore reserves because magnetic separation can be applied in every presently producing district of the region and to other than naturally formed magnetite. It has also been ascertained that magnetite is widely distributed among the other oxides of iron which form the bulk of ore deposits and may there be used as an aid.

ROASTING

Roasting, as applied here, is heating hematitic ore-formation to a temperature below its fusion point for the purpose of converting non-magnetic iron oxides to the magnetic oxide. Separation is effected by passing the roasted material over electro-magnets.

This combination came into practice as a result of a large tonnage of material set aside as tailings created by washing and Rheolaveur-jigging operations at a Mesabi mine. These tailings consisted of pieces of large size and were equivalent to crushed, washed lean-ore; but due to the shape of the particles and due to combinations of porosity of the oxides and density of the chert they were not amenable to further improvement by washing or jigging.

In 1934, as a result of extensive and successful experimental work by the Mines Experiment Station, a pilot plant of semi-commercial size was built on a Mesabi property. The iron-content of the tailings piled there ranges between 35 and 38 percent. After crushing, to have all pieces less than 1 inch, the material is heated to a dull red (about 500° C.) in a specially designed apparatus fired with oil where, under proper manipulation with respect to atmosphere, the iron oxides lose a little oxygen and take on magnetic properties, which enable separating them magnetically from the associated leaner particles and loose gangue. The method is, of course, also applicable to unmined material. For the present it has the appearance of being an appendage to a washing-jigging plant; however, it is to be regarded as merely an initial step in introducing the method. The economic features are such that this treatment is a practical thing to do.

METALLIZING

Metallizing, direct reduction and making sponge iron are terms used to indicate the same thing. Metallizing is a step beyond roasting-magnetic separation, because a higher temperature and a more strongly reducing atmosphere are used. In this procedure one is just a step removed from an open-hearth or a blast-furnace operation. Ore and coal are mixed and heated, to about 1000° C., long enough to drive off the oxygen and leave not an iron-bearing mineral but a mixture of metallic iron and gangue

¹⁰ Pearce, C. M.; Minnesota Sintering Company—Ironton Plant: Proc. Lake Sup. Min. Inst., 25:164-169, 1926.

Harrison, P. G.; The Adaptation of the Sintering Process to Soft Ores: Proc. Lake Sup. Min. Inst., 28:67-74, 1930.

¹¹ Swart, W. G.; Mesabi Iron Company Reduction Plant: Proc. Lake Sup. Min. Inst., 23:111-116, 1923.

Anon.; Manufacture of Iron Ore Out of Near Iron Ore at Babbitt, Minn.: Skillings Mining Rev., Aug. 25, 1923, pp. 16-18.

minerals. This product is called sponge iron. Its iron-content is exceptionally high. It can be given a magnetic separation treatment, or it can be briquetted, and then shipped to be melted in regulation steel-making furnaces to remove the gangue minerals as slag.

This type of work has been given very much thought and attention. It is not yet being used commercially in the Lake region but seems to be only a few years removed. It is mentioned to indicate what the trend of ore-treatment to date has led up to as the next step and to show that that ore material which has been considered too difficult to improve by using processes dependent on water may yet prove to be handled advantageously by applying thermal processes using high temperatures.

FLOTATION

Flotation suggests almost any metal other than iron; nevertheless, in 1931 a Cuyuna mine-operator built a treatment plant in which a flotation cell was used successfully. The ore is a type of manganiferous iron-ore which, due to a high silica-content, was not marketable in its crude state. The silica was firmly bound to the oxide minerals and needed fine grinding. The mine product was crushed and passed directly to vibrating tables, the rejects of which were treated in a flotation cell. This combination produced an ore suitable for conversion to spiegeleisen. Being a new venture in milling ores the plant was started as a large experimental plant. Because business came to a standstill in 1932 no work has been done there since then and the best combination of equipment has perhaps not been determined. It is another step in advance.

This seems not to be confined to special manganiferous iron ores. Experimental work by Adams, Kobey and Sayres¹² with tailings from Mesabi washing plants raised 17 percent material to 57 percent with a recovery of 67 percent, at a cost of \$1.30. They concluded that

¹² Adams, A. S., Kobey, S. M., and Sayres, M. J.: Flotation of Hematite a Laboratory Success: Eng. & Mag. Jour., vol. 132, No. 2, pp. 53-55, July 27, 1931.

¹³ Zapffe, Carl; Manganese Ore by the Bradley Process: Trans. A. I. M. & M. E., vol. 27, pp. 68-80, 1929.

hematite from the Mesabi district could be effectively treated by flotation in the laboratory. They obtained optimum results of 59 percent iron with a recovery of 74 percent of the iron used in the feed. They believed flotation applicable to at least 220,000,000 tons which they said the Minnesota Tax Commission listed as non-merchantable ore.

Flotation may be the process suitable for the conversion of tailings to usable ore. The disposition and the conservation of tailings is being protected by fee owners, who anticipate their use in the future.

LEACHING

Bradley developed an ingenious method¹³ whereby he made a high-grade manganese ore and an iron ore from ordinary ore-formation of the Cuyuna District. The crude ore-material contained about 13 percent manganese, 35 percent iron and up to 40 percent silica. The material was roasted to make a soluble oxide of manganese which could be leached from the rock by a solution of ammonium sulphate, leaving iron oxide and quartz as a residue. From this ammoniac solution an insoluble oxide of manganese was precipitated, and from the residue iron ore was made by washing it free of the loose quartz. While the process was designed to make a high-grade manganese ore, it yielded a greater tonnage of iron ore.

National political conditions were more a factor than economic conditions in preventing the building of a commercial plant. The process deserves mention because it shows that even so unusual a

method as leaching is technically sound and may become a commercial enterprise in the Lake iron ore districts. It is applicable to material so low in iron that it is not apt to be included in estimates of potential ore reserves.

SUMMARY

From the review presented of the various methods of ore-treatment we see:

(1) That though ore has been shipped for 80 years ore-treatment was inaugurated on a large scale only 25 years ago and consisted then of one very large plant designed to treat large quantities of ore-material which contained loose, sandy particles that were to be removed by washing. By this method one-third of the crude-ore tonnage was wasted; nevertheless, it was economically practical, and it appeared to be the only applicable method of ore-treatment likely of adoption.

(2) That the equipment used in the earliest washing plant eventually became greatly simplified and recoveries have been increased. We have now plants even of portable types and more types of ore-material have become subjected to washing. Washing plants are now distributed along nearly the full length of the Mesabi District.

(3) Jigging deemed impractical became adopted, both as a separate installation and as an adjunct where washing is used.

(4) Typical iron-bearing formation is being converted into a shippable product by roasting it and following with magnetic separation.

(5) Magnetic separation of portions of iron-bearing formation carrying magnetite has been shown feasible on a large scale.

(6) Drying wet ores and sintering fine ores is being practiced regularly in two or three districts.

(7) Flotation has been introduced.

(8) Leaching has been shown feasible, using ore-formation of very low metallic-content.

(9) Mixing and grading are being carried out to a high state of perfection and constitute the ultimate purpose.

This indicates that in 25 years we have experienced successively a marked



expansion in the adoption of ore-treating processes. Expansion was not promoted because of a dearth in reserves. Each process was prior to adoption viewed unfavorably but when adopted in each instance a better product for use in the furnace was the result. Several of the processes are being just now introduced and have not yet had a chance to be developed to the point of greatest application. Of importance is the fact that each process is fundamentally sound and for each a place has been found.

As one reviews a method or process it seems to stand as a form of treatment of its own; but we discern that with each improvement made in an existing process a new field of investigation was thereby opened and there now exists an overlapping and a partnership between virtually all of the processes. There is no longer a sharp division between them.

Removal or reduction of silica has been the basic requirement. Always much of the high-grade ore of the future will be obtained from high-silica material. Ore is a relative term and is whatever the trade will take at any specific time. The cost to make pig iron will determine what will constitute ore and the iron-content may not always be what is required today. The permissible limit of silica has changed. High silica is not always a deterrent for we see that when greater slag volume is required, as is true when high-sulphur is to be combatted, it is achieved by using siliceous iron ores, or even gravel. This need of silica is often met by using standard ores that are high in silica and which would otherwise be regarded with disfavor. Certain properly related conditions ever arise and act as letting down the bars and enable adoption of and expansion in ore-treatment methods, rather than mean that the ores are descending naturally to a lower grade or that the quantity of known ore reserves is shrinking.

Even the cost-factor has taken on a new aspect. Cost to improve a certain material may be regarded high if the review stops at the mill. It may cost more to make a ton of treated ore but it is worth more. Ore may some day be sold on the merit basis; who knows? All ores as mined or milled are sooner or later mixed and thus collectively create a greater value somewhere. Such increased value probably always offsets the cost to treat ores; otherwise, it may be reasoned, it would not be done.

The limits to which ore treatment can be extended is not dependent alone on the available quantity of desirable crude material constituting the formations of each ore district. It is also dependent on factors that are economic in character, originating and governed by conditions far distant from the ore field. They originate through federal or state legislation, and through revolutionary changes in the steel industry as a whole. Right now we need think as much of such sources of dislocations as to the limitations of ore-treatment processes because the trend in legislation seems to be adverse to the present industry.

To me it seems that from the standpoint of ore-treatment the mining industry has only of late years been supplied with a variety of adequate tools and that we are now entering a period of time when we are to learn where and how to fully apply those tools. It seems injudicious to presume that the tools will not be used. Man's ingenuity will attend to that. The quantity of crude ore-material may be counted in many billions of tons waiting to be split up to free each unit of iron oxide. We can not judge the whole by a single method of treatment. Each method is superior as to some one special feature, and whatever limitations appear in it are as an invitation to add another method. This can hardly be emphasized sufficiently. The manner in which new factors have of late years become the bases for encouraging higher research in ore-treatment into ever widening fields as to methods and materials has been fully presented by Reed,¹⁴ by Davis¹⁵ and by Williams,¹⁶ who have long been able investigators in such work.

EXPERIENCES AS TO LIFE OF ORE RESERVES

With the Lake Superior region supplying each year 80 to 85 percent of all the ore this country uses, we frequently undertake to ascertain something about the life of the reserves. Although many pass it over by declaring that no fear of early exhaustion exists and that the future will take care of itself, the executives that battle with the intricate problems of the industry ever want to have some idea where things stand. To them it is a matter of paramount importance, as it is also to many states, municipalities, associated industries and countless investors. A calculation becomes necessary be it ever so speculative. To all people the single readily intelligible figure pertaining to reserves is the one which indicates not the total tonnage but the number of years the total tonnage will last.

Although this subject is always under review it seems to culminate about every 10 years. This is one such period. In such previous periodical reviews we can always read the same fears and hopes and the same governing factors and conditions bearing on a calculation. Whatever of them we propose today was proposed 30 years ago.¹⁷ Tonnage estimates

were compiled; average annual consumptions by periods, past and future, were calculated; the increasing use of scrap iron and competitive materials was emphasized; improved methods of mining, ore treatment and furnace practices were predicted; and that new ore districts were unlikely of being disclosed and that the increments from newly discovered ore bodies would be small was mentioned. Each time a remarkably similar life-figure was the result. A further similarity exists in that calculators arrived at a relatively short life.

In Minnesota, Michigan and Wisconsin iron ore deposits are studied very carefully each year by state commissions whose duty it is to value them for taxation. This provides the best available compilation of the tonnage of known ore reserves. Statistics pertaining to ore produced have been compiled by many authoritative bodies; and as to past production no inaccuracies arise. The manner of use of known reserve tonnage and tons to be shipped to determine life varies with the reviewer. The method used most commonly has been to plot the annual productions and speculate therefrom what the average annual production is apt to be in the near future and then figure how long the known reserves would last. For good measure the reviewer adds a few years, as he may then be influenced by the prevailing political and economic conditions.

In 1905 Törnnebohm¹⁸ estimated that the known reserves of the world would be exhausted in about 1955; and that if the United States increased its output as it had in the previous 30 years it would exhaust its reserves in 20 years, or 1925. Van Hise and Leith¹⁹ concluded, in 1911, that the then available ores would probably be exhausted in 50 years, or in 1961. In 1925 Lake²⁰ estimated that if the rate of increase continued as in the past the Lake Superior reserves would be exhausted in 1946, but if only the past 10 years were used as an indication of the rate of increase the year of exhaustion would be 1952, and allowing for additional probable ore 20 more years might be added to the life. Beginning with 1925 ore properties were acquired to safeguard against the then contemplated shortage of ore. There is now no apparent change in mining or using ore due to the contemplated shortage broadcasted in 1925; nevertheless, in the past few years many leased ore properties containing all told many millions of tons of ore have been sent back to their owners. A surplussage is recognized. As a result of the business depression, from which we are now emerging, the opinion has gained circulation that life has thereby alone been extended 10 years.

This signifies that, if the above quoted calculations of life are soundly based, the industry moves along on the premise that a supply of 25 years or so is economically sufficient and that the supply can be augmented when needed. In times of approaching shortage, so considered, the industry has done whatever was

¹⁴ Reed, T. T.: General Principles of the Beneficiation of Iron Ores: The Blast Furnace and Steel Plant, April to September, 1926.

¹⁵ Davis, E. W.: Progress in the Beneficiation of Minnesota Iron Ores: Min. and Met., 7:280-285, 1926.

¹⁶ Williams, C. E.: Iron Ore Beneficiation: Min. and Met. 12:186-188, 1931.

¹⁷ Leith, C. K.: Iron Ore Reserves: Ec. Geol., Vol. I, No. 2, pp. 360-368, 1906.

¹⁸ Törnnebohm, A.: The Iron Ore Supply of the World: The Iron Age, Nov. 2, 1905, pp. 1158-60. (Translation).

¹⁹ Van Hise, C. R., and Leith, C. K.: Geology of the Lake Superior Region: U. S. Geol. Surv. Mon. LII, p. 492, 1911.

²⁰ Lake, M. C.: The Future of the Lake Superior District: Proc. Lake Sup. Min. Inst., 24:48-67, 1925.

needed to provide itself with enough ore to enable maintaining a money-value for the ore it possessed. Ore not up to par in its natural state has been processed to make it usable by the then existing processing and reduction methods. Ore-reduction methods have been changing; ore-treatment processes have been advancing substantially in effectiveness; the two go together.

In 1910 Kemp²¹ compiled 72,000,000,000 metric tons of ore formation as a potential reserve for the Lake region, including all material analyzing 35 percent or more. In 1911 Van Hise and Leith²² estimated 67,640,000,000 long tons, using a depth of 400 ft. for the Mesabi district and 1,250 ft. in the districts having steeply inclined formations, and containing 35 percent or more of iron. These two estimates have been quoted frequently and have actually gained the significance of being ultimately usable material. That is open to great doubt. It is of consequence only in so far that this tonnage of ore formation is huge and provides justification for thinking of life in terms of more than only a few years. The market price of ore in future years must ever be reckoned with if tonnages of sub-marginal material are injected.

STATISTICS BEARING ON LIFE OF RESERVES

We have now had 80 years of ore shipment from the Lake region. Up to

²¹ Iron Ore Resources of the World; XI International Geol. Congress, Stockholm, 1910, vol. I, pp. 32-36 (J. F. Kemp, for United States).

²² Op. cit.

²³ Sweet, A. T.; The Year's Research on Iron Ore Beneficiation at the Michigan College of Mines and Technology; Proc. Lake Sup. Min. Inst., 28:62-66, 1930.

Williams, C. E.; Iron Ore Beneficiation; Min. and Met., 12:185-188, 1931.

Davis, E. W.; Iron Ore for Centuries in Mesabi Range; Fair Tax Key to Development; Steel, May 8, 1933.

1896 annual increases were small. The period of 1896 to 1916 was one of large annual gains. From 1916 to 1934 the annual productions varied annually between wide limits, and although for some years productions were very large a general downward tendency is exhibited for the whole period.

The depression-period has put a severe bend into the annual production curve. It is more logical to interpret this as meaning the end of the period of great annual increase from the old base and as the beginning of a new curve from a new base. The new base is at a lower elevation. It would be unwise to believe that the same big annual increase that we had before 1929 could continue. There will follow now a smaller average annual rate of increase. Those who are most concerned with the production and allocation of these ores believe now that 40 to 45 million tons is apt to become the normal annual consumption and that the days of 60-million-ton shipments are past. This would mean that we will have years when production would be around 35 million tons, a thing which happened only once in 19 years—between 1912 and 1930 inclusive.

Citizens of the state can not get away from the idea that much ore has escaped taxation and, therefore, has never been included in estimated reserve tonnage, meaning that more ore exists than is admitted. Some students dwell strongly on the belief that ore-treatment processes will be developed to yield ore from the leanest of ore-formation. Some believe that methods of ore-reduction will be changed to make possible using lean ore-formation. A variety of views have been offered to substantiate such trends.²³ We might doubt the soundness of some such things and still we can not say no to them because we are aware that marked advance has been made in the arts, only we do not know how to translate it into figures.

To me it seems that all changes I have recited and all changes that occur every year in the general practice and the industry have made themselves felt in one way or another and have produced a collective effect. There have been losses and there have been gains. The carefulness and the sincerity of purpose in the work of the estimators of the several states is acknowledged and we continue to use their estimates. Local disputes have not been with these men but with the valuation authorities. We are not now considering values. The estimators revise their estimates each year, and when they add new tonnages they do so because those who control the ore deposits have made marketable ore from theretofore unmarketable ore. How this conversion may have arisen is now germane only in that it indicates that ore-treatment has played an important part. It is a recognized fact that the quantity of newly discovered high-grade ore in the aggregate has for many years played but a small part.

In 1915 the estimated reserve for the region totalled 1.68 billion tons; in 1933 it totalled 1.45 billion tons. This shows a loss of 230 million tons in 19 years, meaning an average loss of 12 million tons per year, whereas shipments in the same span of years averaged almost 48 million tons. The period of 1915 to 1934 is an excellent period to use because it is long and in it every feature of estimating, taxation, quantity of ore produced or used, and the introduction of various ore-treatment processes has arisen, we had the biggest of war booms and the deepest retrenchment from an economic depression, and enables obtaining like never before a representative collective effect. If the same shrinkage per annum continues, and we see no reason why it should be materially greater, then the estimated reserve of 1.46 billion tons as of 1933 produces a

(Concluded on page 52)



MACHINES as SERVANTS of SOCIETY*

By RALPH E. FLANDERS†

AGRICULTURE is more prosperous, the manufacturing and distributing industries are improving and most of the metal prices are holding firm or slowly increasing. That is to say, a business recovery is under way. The normal course would be to cease worrying about the political and economic conditions under which business

must operate, accept these as inevitable, and concentrate on making hay beneath the rays of the newly risen sun of prosperity.

Quite evidently your program committee takes another view, as it has asked two at least of your guests to carry on with the questions which have been troubling us for five years past. In so doing the program committee has shown real wisdom; for it may very well be that the beginning of a period of prosperity is the best time, perhaps the only time, to mitigate the rigors of a suc-

ceeding period of business recession. Being myself quite convinced of this I am glad to accept the committee's invitation and to appear before you this morning.

We are of course concerned with something more important than the maintenance of good business. In the years behind us we have witnessed a mass of human misery—some of it physical, more of it mental and spiritual—greater than we would willingly see again. And at the present time we are faced, in consequence, with economic, social and political proposals of such varied quality that, while some will prove most valuable in protecting us from disaster in the future, others will tend to aggravate the very evils they are intended to cure.

Let us examine our problem and our proposed solutions; and as a first step let us state our purposes as broadly and simply as possible.

We desire to produce and distribute to the citizens of this country more goods and services than ever before. We are determined to do this with much less fluctuation in the volume as between good times and bad. We wish to provide a more equitable distribution, being particularly concerned lest any one able and willing to do useful work may find himself deprived of the opportunity and of the resulting wages and sustenance.

Let me say at once that I believe these problems to be soluble, but not by any single policy or remedy. There is no

panacea. There are a number of controlling factors, and each of these is subject to improvement by wisely chosen policies, and these policies are not so conflicting that they cannot be combined into a technique of economic improvement.

Some elements of that technique can be seen with certainty, others will have to be developed by experiment. With those characters of our subject clearly in mind, we will consider the elements with regard to which we may immediately come to useful conclusions.

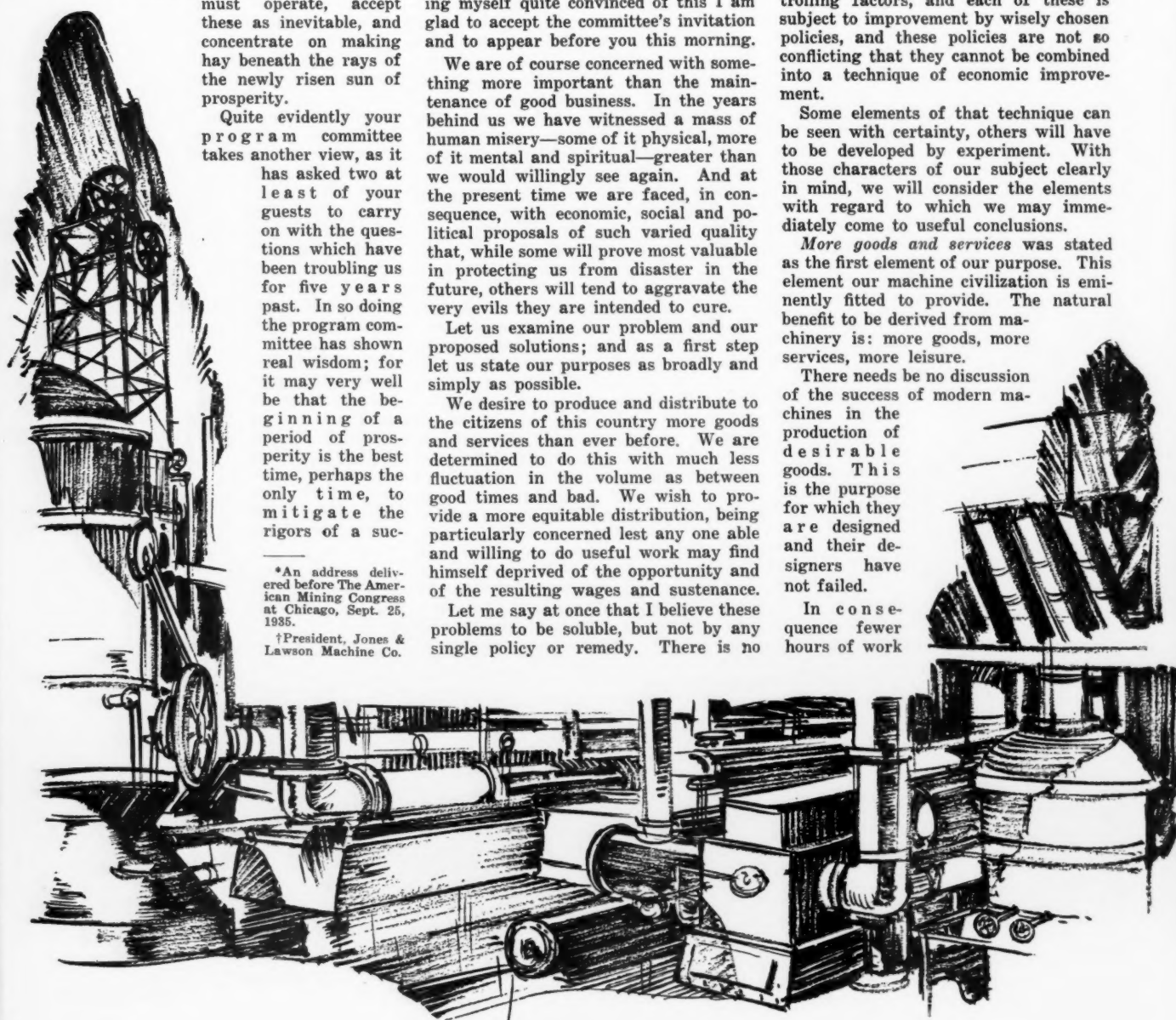
More goods and services was stated as the first element of our purpose. This element our machine civilization is eminently fitted to provide. The natural benefit to be derived from machinery is: more goods, more services, more leisure.

There needs be no discussion of the success of modern machines in the production of desirable goods. This is the purpose for which they are designed and their designers have not failed.

In consequence fewer hours of work

*An address delivered before The American Mining Congress at Chicago, Sept. 25, 1935.

†President, Jones & Lawson Machine Co.



and fewer workers proportionately are needed for providing the goods which go to make up a generally high standard of living. This leaves an increasing number of people free to provide the services—such as teaching, medicine, recreation, travel, personal service, etc.—which are the particular gifts of an advanced civilization.

We must not forget that in the increasing list of desired services many are best furnished by government. This means that much of our spending for personal benefit will be done socially instead of individually. Higher taxation, *wisely spent*, constitutes one of the desirable developments of a mechanized civilization.

But the productivity of our machines is such that they offer a third gift in addition to increased goods and services. For the first time in the world's history they add the boon of leisure, after the physical needs have been supplied.

Goods, services and leisure, sufficient for the reasonable needs of all of us! These are made available by our machine-based civilization; and in no other time or place and by no other means have they been made available. Our machines have not failed us here.

Stability of performance, is another story. In this regard the machine age suffers by comparison with other types of social structure.

Of all types the purely agricultural gives the highest degree of surety to those dependent upon it. Given freedom from drought or other natural calamities, and protection against war and social turmoil, an agricultural society can

depend on a stable standard of living year in and year out. But this stability is enjoyed at the expense of abundance. It is the machine plus the plow, not the plow alone, which offers a full provision of goods, services and leisure. Agriculture at its best offers the relative comfort of the Norman farmer. At its worst it

stabilizes the hand-to-mouth struggle for existence of the Chinese peasant.

Machine manufacture offers a high standard of living but unstable enjoyment thereof. Agriculture of the subsistence type offers stability, but on a low scale. The problem is to combine the elements of abundance and stability.

The problem thus posed is a highly complex one, but it presents certain salient features, to which we will confine our attention today. These features must be understood and controlled first. The minor complications can not be clearly understood in advance of this, and we need not consider them here.

The three salient areas for the determination of effective policy are (1) the financial area, (2) the area of industrial and occupational practice and (3) the interrelations of the various classes of society. In these three areas we must initiate and perfect new policies if we are to mould our social structure into something more desirable than we have endured in the recent past.

In the financial area the effective regulator has been and is *money*, operating through the profit motive and by the mechanism of competition. The profit motive and competition are not out-moded and harmful phenomena. As we shall see later, there is reason to believe that the severity of our crash was in good part due to a perversion of the profit motive and to a large scale abandonment of competition. Safety will require an intelligent return to both.

But our first concern is with the characteristics of our money.

Money constitutes that flow of purchasing power which is expended in the production and distribution of goods and services—which flow, when the system is in health, is just sufficient to provide the consumer with the means for purchasing the goods and services offered.

There is no mystery about this. On the other hand, there is no time to go into details. Let it stand as a simple statement that in a stable population with a stable standard of living, all the sums expended for raw materials, supplies, labor, salaries, power, heat and light, repair and replacement of machinery, selling expenses, rent, taxes, interest and dividends will exactly provide purchasing power for the goods produced at the prices offered or paid. This supposes also that the business is not adding to or diminishing its surplus,

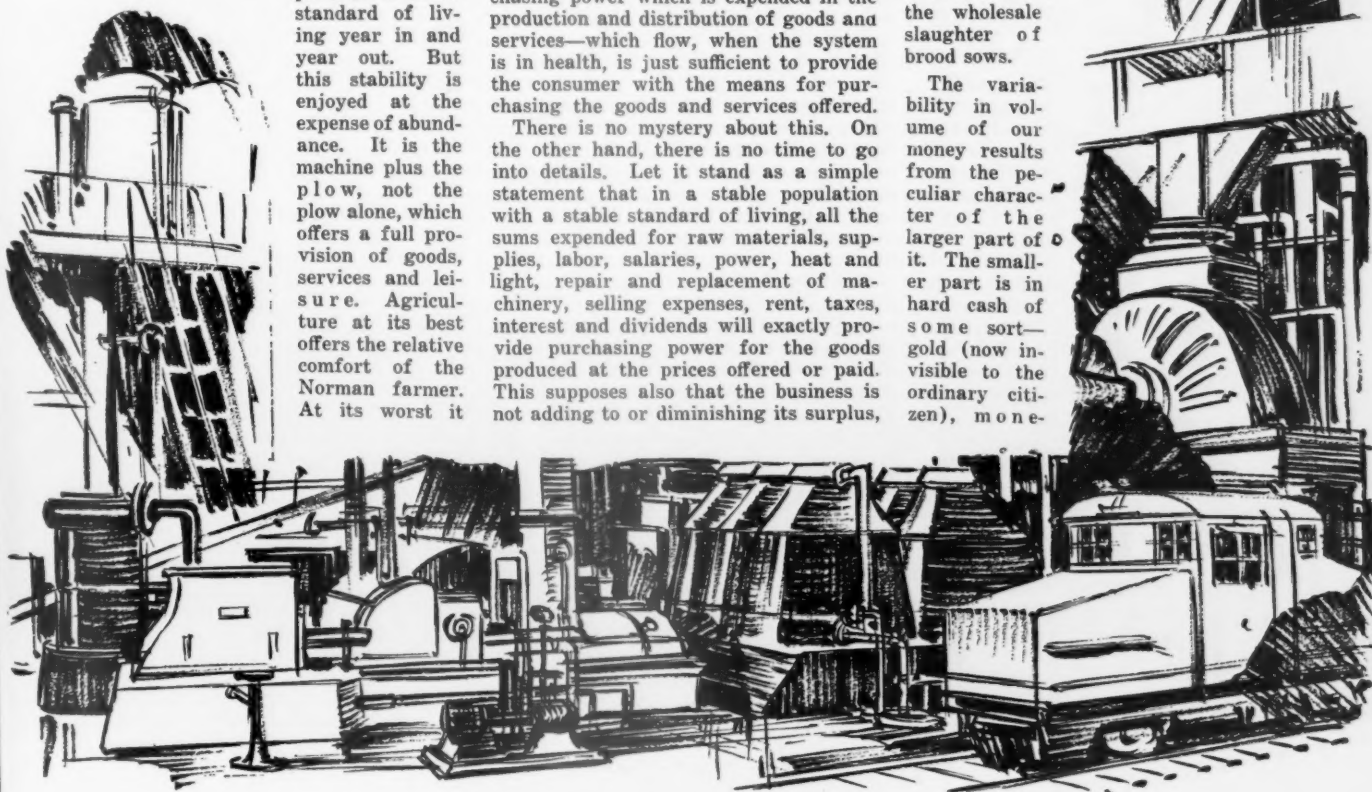
and that none of the persons or firms to whom the funds are paid hoard any part of them.

Now this even level of production is good, compared with what we have had, but we are more interested in the possibility of a continuously increasing output, and adequate purchasing power to distribute it. An increased output is needed to maintain a standard of living for a growing population; and a still greater increase is needed for the rising standard of living which our machine civilization is quite capable of providing. How shall we so redirect this stream of purchasing power as to provide the needed increase in equipment without diverting it from consumer and thus decrease their ability to purchase the goods already being made?

The answer to this question is simple. Money is not fixed in amount, but expands and contracts; and it has been shown that as a matter of fact it does expand when demand for goods is active and new equipment is being provided.

This variability in volume is the most interesting, useful and dangerous thing about money. The strange part of it is that we are so liable to forget this outstanding fact when we are searching for the causes of social and economic disorders; and as a result we ascribe causes to everything else under the sun, and run for remedies to anything from the 30-hour week to the wholesale slaughter of brood sows.

The variability in volume of our money results from the peculiar character of the larger part of it. The smaller part is in hard cash of some sort—gold (now invisible to the ordinary citizen), money



tary silver and paper money, much of which latter is also expansible and contractible by operations of the Federal Reserve Banks which we will not stop to describe.

But this accounts for only 10 percent of the money. Ninety percent of it has no physical, corporeal existence whatever. It consists of credit balances in the commercial banks of the nation. We do our business with tens of millions of dollars of bookkeeping entries which could, apparently, be wiped out by the vigorous application of an ink eraser.

This credit money is, in fact, generated by bank borrowing—borrowing, that is, at commercial banks, not at savings banks. At savings banks one can borrow only what has previously been deposited. At the commercial bank the money borrowed had no existence until the borrowing took place. It will disappear when the note is paid. The process is very simple. A borrower signs a note which becomes a new asset of the bank, and his deposit is credited with the appropriate sum which becomes a new liability. The new funds may circulate far and wide, but they remain dependent on that note. When the note is paid the funds disappear. An asset and a liability are wiped out of existence.

In brief, when the banks are loaning money faster than it is being paid up, the volume of money is increasing. When borrowers are paying up faster than new loans are being made, the volume of money is decreasing. If all debts were paid up and no new ones incurred, all of our credit-money—or nine-tenths of our normal total—would disappear, and the insufficiency of the remaining “hard cash” would compel the closing of practically every business establishment in the country.

We have only to look a little way back into history to realize the importance of this flexibility in the volume of credit money.

In the war years citizens loaned their credit to the government, generating thereby new billions of credit money, far beyond any current savings. The insatiable demand for war materials, plus an ample supply of credit money raised wages and prices under the normal operation of supply and demand to inflationary heights, which could not be maintained after the demand for goods and the supply of new credit ceased. The dislocations of finance, industry, agriculture and labor induced by this credit expansion have disturbed society to the present day, and its evil efforts have not yet been entirely liquidated.

Again, in the years from 1925 to 1929, a swollen flood of credit money was poured into real estate and security speculation—largely by borrowing on margin—and prices in these areas were thereby pyramided to reckless heights. When the frailty of this fantastic credit structure became evident it fell, and was then revealed in its true light as a monument of bank indebtedness. In the five year liquidation of that indebtedness many billions of purchasing power were destroyed.

It is evidently a matter of prime importance that the quantity and quality of credit money be controlled, if we are to have a stability expressed in a rising standard of living, instead of an instability which periodically destroys our mechanism of distribution by first inflating and then destroying purchasing power.

Without going into the necessary refinements I am going to suggest the major elements of financial policy which seem to be indicated. Under the new banking law, and under certain provisions of the Glass-Steagall Act—which seem to be well adapted to the purpose—we must (1) limit the volume of credit generated by unsafe means for unsafe purposes, as for security speculation; (2) we must keep the total volume of credit employed in business constant *except* for an annual increment dependent on our population increase and, what is still more important, an additional annual increment for a rising standard of living—say 5 or 6 percent in all; and (3) we must provide effective and perhaps new means of injecting and retiring the necessary controlling credit directly into business.

The foundation of this generation of safe credit must be the old-fashioned 30-, 60- or 90-day loan for financing production and distribution. To provide such loans in sufficient quantity it is necessary that there be willing and safe borrowers; and this in turn requires that political and financial conditions be such as to generate confidence. Confidence is a primary requirement.

But still more credit may be needed. If so, a direct application of credit to government expenses and the retirement of that credit by taxation offers the most hopeful field for investigation and experiment.

All of this involves novelties in financial and fiscal practice, but we must turn to carefully designed novelties in finance as in mechanics if we are to improve our present deplorable practice. But in finance, as in mechanics, we must make sure that our novelties are based on natural law and solid experience.

Industrial and occupational unbalance is the second problem requiring a determination of policy.

These unbalances are taking place all the time, but are for the most part self corrective so far as concerns business as a whole; though individual business men are ruined, and individual workers are thrown out of employment in the course of the re-adjustment.

But there are certain times when mal-adjustments occur rapidly and on a large scale, so that the normal processes of adjustment break down. These large scale mal-adjustments are particularly prone to occur during inflation and during depression.

For instance, the war inflation, already described, added to the withdrawal of millions of acres from wheat production in Europe, resulted in an abnormal demand and an abnormal price for wheat in this country, during the conflict. This in turn inflated the price of farm lands,

leading to an active market in them supported by bank credit—that is, bank indebtedness. When the price of wheat fell with the war's end, farm values could not be maintained nor could mortgages be paid.

This is by no means the whole story of wheat, but it is an essential element in the total unbalance of the industry of wheat farming.

An unbalance was developed in the 1929 credit spree in the over-building of urban hotels, office buildings and apartments.

An unbalance not generated by inflation is evident in the cotton textile industry. Here the old New England mills paid out their depreciation funds as dividends instead of holding them for replacement as machinery wore out or became obsolete. In consequence, in a period of rapid improvement in textile machinery they found themselves without means to re-equip. Meanwhile it was discovered that Southern labor at lower wages is satisfactory for making the cheaper grades of cotton cloth, and in consequence new capital built improved plant under scientific management in the favorable Southern labor market. There was thus a practical duplication of plant capacity. When to this was added the competition of the new rayon industry, an unbalance of the first order developed.

As a final example we have the coal industry, in which the discovery of new supplies of both coal and oil, and the increased use of the latter for driving ships, heating homes and for power, plus an increasing hydro-electric development, have all together generated a permanent crisis in that industry.

Whether for agriculture, textiles, coal or any other unbalanced industry, there are two principles available for remedial policy. The first attempts to conserve the wages, salaries and profits previously derived from the industry. As demand lessens, prices are artificially raised if possible, so that profits may be maintained. Hours are shortened and wage rates increased so that weekly income may be maintained. Of late more extreme forms of support have been offered by the government in the form of processing and other taxes.

Now these and other devices may be justified as temporary expedients. The great fault is that such devices maintain prices and still further limit demand so that a vicious circle is generated. What is needed is the natural remedy which shifts men and capital from unprofitable into more profitable undertakings; this process draws the depressed industry toward the level of the whole instead of holding it there by artificial and unstable means.

To extend the argument from the particular to the general, we find, in a survey of economic balance, its failures and its successes, that we are facing a series of prevalent follies, which are not confined to any class, occupation or political party, but ramify throughout our whole social structure. The essential nature of these follies is that they

seek to set up permanent controls of prices, wages or output based on the immediate advantage of a particular class. And the result of these follies is that the well-being of society as a whole is thereby disturbed, and the group which seeks its own advantage suffers with the rest of us.

An imminent, prospective folly is the attempt to erect into a permanent policy the emergency measures for raising the prices of wheat, cotton and other farm staples. This attempt must fail because its cost bears most heavily on the industrial worker and cannot be shifted from him. It must fail also because it is encouraging increased production elsewhere in the world and must limit the export market of our farmers.

A folly of labor has been to rely on "successful" labor union policy in such industries as the building trades and the railway workers. Wherever and whenever as in these cases, wages are maintained which are out of line with those of workers in other fields, costs are so high that these industries stagnate, and the members of the "successful" unions find themselves out of employment.

Workmen's housing, which should have led recovery, has scarcely started at all except under artificial stimulus, because workmen cannot afford to live in the houses built by "successful" union labor. As to the railroads, the wage rates maintained are not the only element in their decay, but they are the largest single element; and as a result the ton-miles dwindle and the number of railway workers diminishes.

But this type of folly is not confined to farmers and trades union workers. It is to be found in full flower in business practice. The ideal of most organized industries is the trades union ideal—an artificial maintenance of prices exactly paralleling the artificial maintenance of wages. And the penalty is the same—higher prices to society as a whole and in the end diminished volume of business and diminished income to the "successfully" organized industry.

An endeavor was made to organize these follies of farmer, worker and business man into a complete system under the NRA and the AAA. Aside from the minimum wage provisions and the elimination of child labor—which latter was nearly an accomplished fact before the NRA was organized—we need have no regrets at the passing of the one, or the difficult times in which the other finds itself. A summation of follies is not converted into a successful social system even when blessed by government.

In attempting to free itself from the hardships of competition, business will find itself with wage, price and production policies which will lessen its market and reduce its profits.

Furthermore, any endeavor to restrict competition leads directly, and properly, toward governmental control. Competition in price, service and quality is at once the safeguard of the public interest and the best and most natural regulator of employment and production. Indus-

try by itself, or government acting for it, can never solve the problem of control so that the business unit takes its proper place in a balanced economy.

What government can do is to furnish business with the solid foundation of a socially organized money system. In addition, through a properly organized Federal Trade Commission, it can eliminate from competition the fraudulent elements whether as between business and business or as between producer and consumer. More important still, it can itself apply the greatest safeguard against governmental usurpation and tyranny—it can keep effective the laws against restraint of trade. When business as a whole, on the foundation of a solid money system, is willing to submit to the rigors of competition to the degree obtaining in the automotive industry, for instance, employment will increase, more and better goods will be sold for lower prices and governmental control will be an evident impertinence.

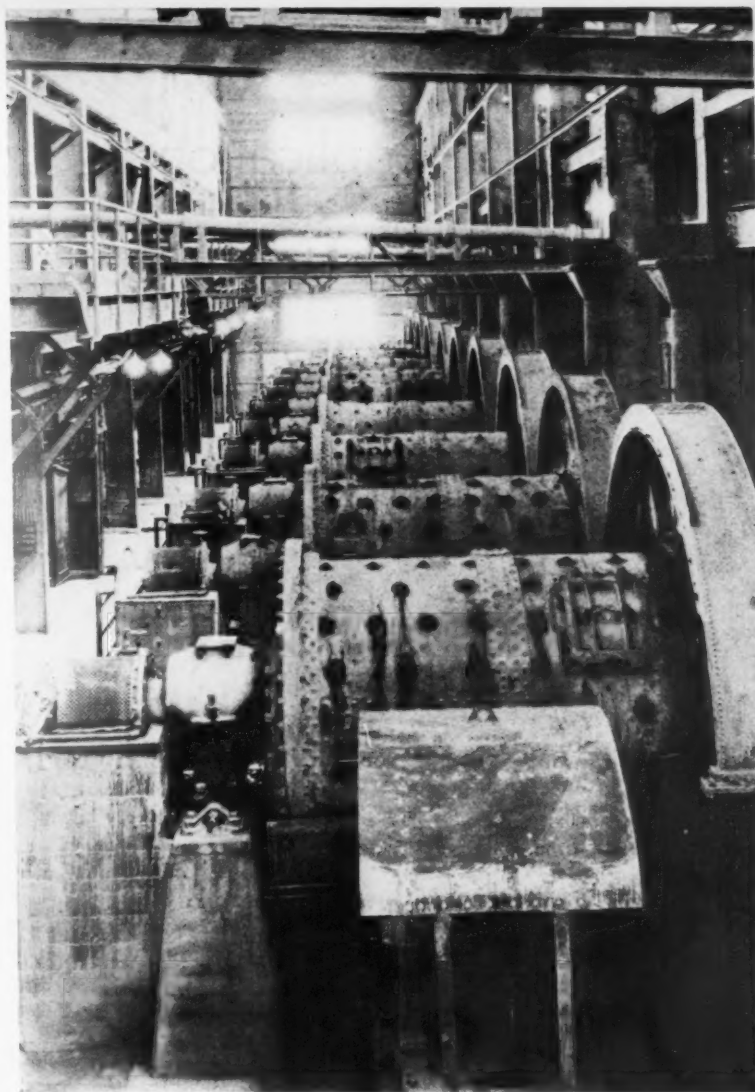
An expansion of industry in this spirit will draw men from the over crowded industries such as coal mining and farming. The returns to those who

leave will be higher than in their old occupations, and the returns of those who stay will be higher as well. In addition the prices of goods will be lowered, and more goods will be made and distributed both to those who stay and those who go.

There is no deadlock. The continued improvement of management and machinery offers the clue. The employment of these factors under competitive conditions is the method. Full employment, adequate leisure, the good wages of an active labor market and lower prices—these comprise the worker's reward, and solve the problem of the depressed industries.

The distribution of wealth between the classes of society was the third field of policy which we proposed to investigate. The financial area and the problem of industrial balance have already been analyzed so far as possible in this rapid resume. We have sketched in broad outlines the requirements for natural stability of employment and production, and for a raised standard of living from

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Practical Application of IRON ORE BENEFICIATION to BLAST FURNACE PRACTICE*

By E. W. DAVIS†

IRON ore beneficiation may be defined as any operation that alters either the physical structure or chemical analysis of an ore as mined, in order that it may be better suited to blast furnace smelting. The real purposes for beneficiating iron ore are: first, to reduce the total cost of producing pig iron; and second, to increase the reserves of iron ore.

Since beneficiation operations increase the cost of producing furnace ore, the improvement made in structure and chemical analysis must be of sufficient value to blast furnace operation to offset the cost of beneficiation. Some beneficiation processes quite clearly reduce the cost of producing pig iron by a definite amount that can be computed, while with other processes the saving is obscure and indefinite. The drying process is an example of the first case, since a definite saving in freight per unit of iron can sometimes be demonstrated. The crushing process is an example of the second case. Here the entire saving made is in the operation of the blast furnace and is quite indefinite, since it depends upon the exact nature of the ore and the operation of the furnace. The sintering process illustrates both cases, since it reduces the moisture and is, therefore, a direct saving in freight, and since it also improves the structure, and results, therefore, in some indefinite saving in furnace operating cost.

The cost of smelting an ore after it has been charged to the furnace depends upon its characteristics, namely, its chemical analysis, its physical structure, and its reducibility. These characteristics may all be modified by beneficiating processes. It is obviously necessary to put iron units into a furnace if pig iron is to be made from it, but the state in which these iron units exist in the ore may be quite as important as the total iron content. In other words, the physical structure and reducibility may be quite as important as the chemical analysis. However, the accepted method

by which the selling price of iron ore is computed depends almost entirely upon its chemical analysis and the only recognition of the value of structure or reducibility is a 15-cent penalty charged against the Mesabi ores. It would obviously be difficult to develop a formula for determining the value of an ore which would take into account structure and reducibility as well as the chemical analysis. However, a more definite determination and a more general recognition of the value of improved structure and reducibility would be of great benefit to the iron ore producers and to the blast furnace operators as well. Physical structure is quite accurately determined by the screen analysis and the crushing strength of the ore, and a method for determining relative reducibility has recently been developed by Mr. T. L. Joseph, of the United States Bureau of Mines, at Minneapolis. It is, therefore, possible to compare different ores on the basis of structure and reducibility as well as on the basis of chemical analysis. However, there is no method by which the iron ore producer can determine just how he should prepare his ore for shipment, because no definite figures are available showing just what the improvements in structure and reducibility are worth to the blast furnace operators. For example, by installing the proper equipment and by spending \$0.10 extra per ton, the iron ore producer may save the furnace operator \$0.20. But, he has no way of knowing at the present time whether or not the increase in investment and operating cost is justified. The iron ore producer and the blast furnace operator are so far apart geographically that it is difficult for the one to appreciate properly the problems of the other.

Although the iron ore producer usually can make some choice in determining

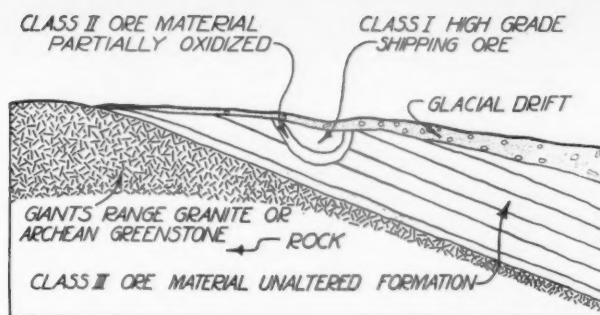
the degree to which beneficiation can be carried, the exact nature of the original ore determines the general nature of the process which must be used and, to a certain extent, the nature of the finished product. For this reason, it is desirable to study the nature of the materials from which the future ore supply of the Lake Superior District will be drawn. In this discussion of ore supply the Mesabi Range will be given primary consideration. It contains by far the greatest amount of direct furnace ore and of low grade material, and for this reason, is of the greatest importance. The remarks which follow will, therefore, apply primarily to the Mesabi Range, but they will also apply, in a limited degree, to the other iron-producing centers of the Lake Superior District.

The iron formation of the Mesabi Range, stretching from the Dunka River in the east to the Mississippi River in the west, is about 106 miles long. The range proper consists of low hills of granite, called the Giant Range, higher and more pronounced in the east, and less pronounced in the west. On the south slope of these granite hills, the ore formation lies in parallel beds, totaling about 500 feet in thickness. Glacial drift of sand and gravel cover the formation, thinly near the granite hills, but more and more thickly toward the south. The iron formation is remarkably continuous throughout its total length, and drill holes or test pits put down practically any place in the district will strike the formation.

The iron formation, as originally deposited, contained between 20 percent and 40 percent iron, but the forces of nature have altered the formation materially. The chief alteration has been caused by the action of water, and in locations where water had easy access

*An address before the American Mining Congress at Chicago, September 25, 1935.

†Superintendent, Mine Experiment Station, University of Minnesota.



IDEALIZED CROSS SECTION OF THE IRON FORMATION OF THE MESABI RANGE

to the formation great changes have occurred. As would be expected, these changes have occurred mostly along the northern border of the deposit, and not towards the south where the formation lies under many hundreds of feet of glacial drift. The water had both an oxidizing and a leaching effect, and while the original formation consisted largely of silica and iron oxide, in locations where the effect of the water was most pronounced, great bodies of ore are found containing very little silica but composed chiefly of more or less hydrated iron oxide. These are the valuable ore bodies from which the high grade ore is being mined at the present time. These deposits are usually in the form of shallow, irregular troughs or basins, toward the edges and bottom of which the action of the water becomes less pronounced. There are, then, three distinct types of material on the Mesabi Range which may be classified as: Class 1, the high grade direct shipping ore lying toward the center of the troughs and basins, and containing 50 percent to 60 percent iron; Class 2, the partially oxidized and leached material usually associated with the high grade ore, and containing between 40 percent and 50 percent iron; and Class 3, the unaltered formation surrounding these oxidized ores, and containing between 20 percent and 40 percent iron. While all three of these classes have been utilized, only Class 1 has been mined extensively.

Figure No. 1 is an idealized cross-section of the Mesabi, showing the Giant Range, with the iron formation lying on the southern slope. Overlying this, more thickly toward the south, is the glacial drift of sand and gravel. Near the granite is shown a basin in which water has altered the original formation. In the center of this basin is the highly leached and oxidized high grade ore, and surrounding this the partially leached and oxidized ore material. Surrounding the entire basin is the unaltered formation.

On account of the geological nature of the Mesabi deposit, it has been a rather simple matter to locate the troughs and basins containing the high grade ore. By drilling and test-pitting, the

quantity and nature of this ore has been accurately estimated. The exploration for high grade ore started with the discovery of the Mesabi Range in 1870, and has continued until, at the present time, the actual tonnage and iron content of the high grade ore remaining in the ground is very accurately known. There is little likelihood that the estimated tonnage of high grade ore will be increased or decreased materially either by future exploration or by actual mining operations. This is a very important statement, and the above explanation has been given in order to show the conditions peculiar to the Mesabi Range that made possible such accurate estimates. The same degree of accuracy in computing the tonnages of Class 2 or Class 3 ore materials cannot be claimed, largely because early explorers were chiefly interested in the high grade ore and preserved little information as to the occurrence and nature of the low grade materials. However, on account of the simple and uniform nature of the geological formations, estimates can be prepared which show roughly the importance of the Class 2 and Class 3 ore materials. These materials, are, of course, too low in grade to be shipped to the steel plants as mined. High grade ores may be manufactured from them, however, and in the following estimates, the quantities of high grade ore that may be manufactured from Class 2 and Class 3 ore materials are reported rather than the actual tonnages of low grade ore. It should be understood that these estimates do not take into account any of the economic factors, such as mining costs, taxes, concentration expenses, etc., that actually determine whether or not the ore is of value. The estimates simply indicate the amount of each of the three classes of ore that exist on the Mesabi Range.

Figure No. 2 shows diagrammatically the quantity of high grade ore that can be mined or manufactured from each of the three classes of iron-bearing material on the Mesabi Range. The size of the ore piles represents the tonnage that they originally contained, the white portion being the quantity that has been mined, and the shaded portion the tonnage remaining in the ground. The ton-

nage of the Class 1, or high grade ore, is very accurately known, as explained above, but the tonnages of Class 2 and Class 3 ores are not so accurately known, and, as a matter of fact, the tonnage in Class 3 may be very materially increased, because it has been computed for a depth of 400 feet only. By extending this depth, the quantity of Class 3 ore may be doubled.

It is evident that the Class 1 ore is a very small proportion of the total ore occurring on the Mesabi Range, and it is also evident that the Class 1 ore has been about one-half used up, while the Class 2 and Class 3 ores have hardly been touched. Just how much longer the Class 1 ore will last depends, of course, upon how fast it is mined, but it is evident that the Class 2 and Class 3 ores together will last almost indefinitely. The future reserves of the Mesabi Range, therefore, lie largely in the Class 2 and Class 3 ores, and these materials must be utilized if the Mesabi is long to continue as an important iron mining district.

The testimonies given by various experts in the Mine Tax Valuation Case at Duluth last summer agreed quite closely that the life of the merchantable ores on the Mesabi Range was from 36 to 40 years. These figures are computed on the basis of no increase in demand in the future. The other mining regions of the Lake Superior District will probably be exhausted sooner than the Mesabi Range. Obviously this is not a life of sufficient length to satisfy those who have made enormous investments in railways, steamships, blast furnaces, steel plants, and all the associated fabrication and manufacturing industries, together with the various cities and towns, all of which combine to form the greatest industrial development of the world. Consciously or unconsciously it is recognized that the low grade ores which are so abundant, especially on the Mesabi Range, will furnish the ore supply required in the future, a supply far greater and more important than the reserves of the high grade ores of the present. If we knew that at the end of 30 or 40 years the iron ore of the Lake Superior District would be exhausted and that all the industries which exist only because of this ore would cease to exist, the future would indeed look dark, not only to the steel makers but to the general public as well. The reason it does not look dark is because we believe that the low grade ore can be utilized for the manufacture of steel at a cost which will compare favorably with the cost of producing steel from the high grade ores. In other words, we have faith that the metallurgists and engineers of the future will develop methods for the use of this low grade iron ore by the time it is needed by existing steel industries.

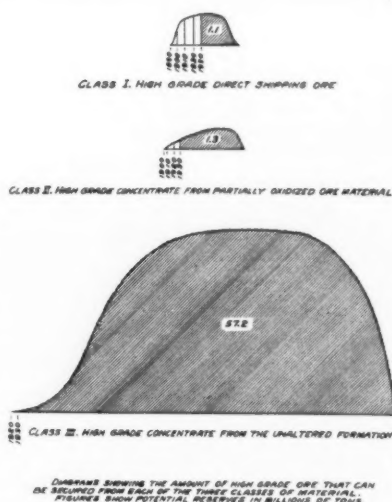
However, the new developments which must be made before the low grade ores can be utilized economically cannot all be made in the mining and beneficiation

operations. The smelting and refining operations must also be improved. There is no reason to believe that the present blast furnace has now reached a state of perfection beyond which it will never advance. The metallurgists of the future will be better men than we are and will be no more content to use the methods and equipment which we have developed than we are to use the methods and equipment which our fathers and grandfathers developed. Just which direction these new developments will take cannot, of course, be stated, but it is certain that the ore-producing industry of the future will be on quite a different basis from the ore-producing industry of the present time. When the direct furnace ore is exhausted, concentrate will be the product sent to the smelting plants; the blast furnace operators will no longer be able to specify the kind of ore they want; it will be necessary for them to develop means for smelting the kind of ore which can be furnished to them. Whether or not this conclusion is correct, it is interesting to study the future in an attempt to see just what kind of material will be available for the smelters. We, of course, cannot know now just what new developments are going to be made in the science of iron ore beneficiations, but we do know the nature of the raw materials which are available, and, therefore, we can reach some conclusion as to just what can and what cannot be accomplished.

We know for a fact that there is an ample supply of this low grade ore. We know that it is quite uniform in analysis and structure from one end of the Mesabi Range to the other. We know that the analysis is close to 33 percent iron and that it is hard and dense. We know that the iron oxide exists in this rock in minute grains and in stringers so small that the rock must be crushed as fine as flour in order to free the iron oxide from the gangue. We know many other more detailed things about this low grade material. If the rock is crushed to —100 mesh, 40 percent of the ore can be recovered as concentrate having an analysis of 60 percent iron, 15 percent silica, and 0.03 percent phosphorus. If the rock is crushed to —200 mesh, 35 percent can be recovered as concentrate having an analysis of 64 percent iron, 10 percent silica, and 0.02 percent phosphorus. The iron-bearing minerals which this low grade material contains are principally hematite, magnetite, and limonite, together with a very small amount of iron silicate. The finer the ore is crushed, the better the extraction, the higher the iron, and the lower the silica content of the concentrate.

Now consider what could be done if it were necessary to use this low grade material in the present state of the art of iron ore beneficiation and smelting. Obviously the ore must be mined, crushed to a very fine size, and the iron oxide must be removed. This iron oxide, being too fine for blast furnace use, must be agglomerated into coarse lumps.

FIG. 2. RESERVE ORE OF THE MESABI RANGE



All of this we know how to do, but if it were necessary, at this time, for the blast furnace operators to depend solely upon this material for the manufacture of pig iron, their costs would necessarily be increased materially due to the increased cost of producing the ore. In other words, if at the end of 30 or 40 years when the direct furnace ores are all exhausted we do not know considerably more about mining, beneficiating, and smelting methods than we do at the present time, the price of pig iron is certain to increase unless we are willing to depend upon foreign supplies.

In 35 years we cannot hope to reduce the cost of smelting through the introduction of any great revolutionary change in the art of iron making which will be developed to a point which will permit 30,000,000 tons to be produced annually. It would take many years to build up such a large industry based on a new and untried process even if we had the process completely worked out in the laboratory. The physicists have been able to bombard a molecule of iron oxide with a stream of electrons and produce pure iron without the use of heat or reducing agents, but not even the greatest optimist would expect this operation to be developed on a tonnage basis within the next 35 years. We can, however, expect greater efficiency, cheaper power, and a more efficient use of existing heating and reducing agents. A project is already quite well worked out which produces cheap hydrogen from the North Dakota lignites. This gas may be delivered by pipe line to the Minnesota iron mining districts, and it may be possible to convert the iron oxide into metallic iron before shipment. Another project intended to produce both cheap hydrogen and oxygen by the electrical disassociation of water from power generated from the wind is well along in the experimental stages. Perhaps the oxygen can be used to enrich the blast in existing furnaces. These

are examples of the types of improvements to be expected within the next 35 years.

If the present type of blast furnace is to continue in use, the iron ore required in the future must have most of the characteristics of the ore used at the present time. If the fundamental principles upon which the blast furnace operates are unchanged, the gases must pass upward through the ore for its reduction and preheating. This means that the column of ore must have a structure which will permit large quantities of gas to pass through it. Since most of the concentrate which can be produced from the low grade ores will be very fine, agglomeration on a large scale will be required. Agglomeration by existing processes would increase materially the cost of producing pig iron. This suggests the idea that changing the design of the furnace to suit the ore might be cheaper than changing the structure of the ore to suit the furnace. This has been done in the copper smelting industry with great success, and some progress has been made along this same line in the smelting of fine iron ore concentrate.

For the beneficiation of low grade ores the processes are quite well worked out, and this operation could be carried on at a reasonable cost with what we know at the present time. As a matter of fact, this fine iron concentrate has already been produced commercially from one variety of low grade ore at a total cost of about \$3.50 per ton, including mining, beneficiation, royalty, taxes, and all other direct operating charges.

The costs of producing this fine concentrate were about as follows:

Cost per Ton of —200 Mesh Iron Concentrate	
64 percent Iron — 10 percent Silica	
Taxes	\$0.25
Royalty	0.25
Mining—3 Tons	0.90
Transportation—3 Tons	0.15
Crushing and Fine Grinding—	
3 Tons	1.05
Concentrating—3 Tons	0.25
Dewatering—1 Ton	0.05
Interest, Overhead, and Other	
Fixed Charges	0.60
Total	\$3.50

It is obvious that if these costs are to be reduced materially, the saving must be made in mining, crushing, and fine grinding, which costs total nearly \$2.00 per ton of concentrate. The mining cost of \$0.90, or \$0.30 per ton of crude ore, can be reduced by the use of better drilling, blasting, and loading equipment. All of the low grade rock is quite hard, and drilling and blasting are important items of expense. Improvements will undoubtedly be made in the field of hard rock drilling, but we can see no possibility of a radical change in drilling methods which will enable us to make a hole in hard rock for blast-

(Concluded on page 54)



Of All Things . . .

So far as the Congress—and the Administration—is concerned, the New Year started out with a bang unparalleled by any Congress. . . . First it heard the President in an unprecedented night address; next it heard an extraordinary budget message read . . . and, hardly recovered from hearing the latter, got the first words of the downfall of the AAA. . . . It was too much. . . . The Senate adjourned for the maximum three days allowed it. . . .

Justice Roberts had just finished reading the final words of the momentous AAA decision. . . . There was a momentary stunned silence. . . . And at that moment there reverberated through the marble halls a loud crash. . . . There, said one of a group of newsmen rushing downstairs to wire stories on the ruling, goes the AAA. . . . A waiter in the Supreme Court cafeteria had dropped a tray of dishes. . . .

The President promised there wouldn't be any new taxes this session. . . . Must have heard that motorists of the Nation alone paid \$1,200,000,000 in taxes last year . . . which is more than the automobile factories received for all the new cars sold. . . . And if you're one of those chaps who smokes a package of cigarettes a day, you paid the Government \$21.90 in taxes last year without thinking about it. . . .

No one questions that the opening of the second session of the Seventy-fourth Congress will ring down the corridors of history—but for what? . . .

Well, for one thing, it marked the delivery of the most listened to, and most discussed political speech ever heard in the halls of Congress. . . .

For another, the "quarterback" took the ball completely away from the opposition on the neutrality issue. . . . And no wonder Secretary Perkins had a big broad smile on her face when she left the White House earlier in the day after the President went over the speech with his Cabinet. . . . The "play" made for labor's vote in the coming campaign wasn't lost on her . . . or labor either. . . .

The Supreme Court decision on the AAA dealt one mortal blow that the Administration isn't sorry about. . . . As best legal lights see it, any such plan as the Townsend old age revolving pension idea is unquestionably unconstitutional in the light of the majority opinion. . . . For which New Dealers are very, very thankful. . . .

One good reason you can rest assured that there will be little Congressional delay about enacting a substitute program for AAA is the 6,000 employees in the AAA setup. . . . Many of these are patronage workers and Senators and Congressmen don't want hundreds of applicants for jobs bothering them just before election. . . .

There's no question about Senator Borah wooing the liberals in his campaign. . . . He wore a red tie to the joint session to hear the President. . . . And he was one of those who didn't applaud once during the speech. . . .

There were other sartorial displays too. . . . "Honest Vic" Donahey, of Ohio, for the first time in his life, wore a frock coat. . . . That made front page in all Ohio newspapers. . . . Senator Donahey is the plain people's idol. . . . The Senate's "baby," Rush Holt, of West Virginia, sat attentive in a belted gray suit. . . . Illinois' J. Ham Lewis was the cynosure of all eyes in the most formal of all attires on the floor, even down to an Ascot tie. . . .

Seventy public bills hit the hopper in the House on the first day. . . . Only one in the Senate—the neutrality bill. . . . Senate rules do not permit bill introductions on the first day, but unanimous consent was obtained to introduce the Pittman measure. . . . Bills in the House ranged all the way from the bonus bill, number one on the list, to a measure for conservation of herring in Alaskan waters. . . . Besides the Congressmen introduced fully 500 private bills, mostly providing for pensions. . . . And the first of the "big money" bills also showed up the first day—New York's Congressman Beiter asking that \$700,000,000 be appropriated for Federal Emergency Administration of Public Works. . . .

There's one thing about the neutrality measure proposed that will make some early American statesmen turn over in their graves. . . . It abandons the policy of "freedom of the seas" for which America has fought at least two wars and shed much American blood. . . .

Maybe you don't think it was hard to get into the Capitol to hear the President's epoch-making speech to the Congress. . . . Even Chief William H. Moran, head of the Secret Service unit which guards the President, was stopped by a guard. . . . He talked his way in, though. . . . But the laugh of the night was on Brain Truster Rex Tugwell. . . . He was one of the thousands that didn't have a card. . . . He didn't get into the galleries. . . .

It'll take more than promises to win the farmers away from the New Deal. . . . It's been many years since Iowa farm land sold for \$200 an acre. . . .

The Labor Relations Act must be unconstitutional. . . . Fifty-nine lawyers agreed that it is and that's perhaps the first time in history that fifty-nine lawyers ever agreed about anything. . . .



Wheels of Government . . .

WASHINGTON momentum accelerated tremendously with the reconvening of Congress on January 3. In spite of the fact that departments had been operating upon a full-steam-ahead order during Congress' absence, everything took on an air of excitement and confusion. In Washington, where the depression has been a thing read about only, the holiday spirit was gay, and Santa Claus seemed a reality. Certainly political stockings were well filled, and Congress returned to heaped desks, snowed under first by the weather man, and second by the demands, implications, and threats of constituents. The President's annual message was a high point on the opening day, probably higher than ever before in history. With the ballyhooing of the New Deal temporarily hushed by the absence of the Cheer Leaders, the critics had an inning and had made several spectacular if not too successful home runs. At any rate, their clamor elicited a defense of his policies by the President in his message that will long be remembered by those at whom it was aimed and those who listened to, or read, his speech.

All reports indicate that business is on the up-grade and is opening the New Year with high courage. The railroads report greater traffic; the steel industry, definitely the barometer of business, reports better outlook than in several years; the automobile industry is optimistic; the great electrical firms report substantial increases in business, and business generally is giving a good account of itself. Figures from Government agencies estimate that business increased its pay roll by more than a half million persons, and provided employment for a total of 7,100,000 persons, with pay rolls increasing by more than a billion dollars. But in spite of these encouraging figures, and despite the Government priming of the pump, it is estimated that we still have more than nine million people out of work.

However, business seems more confident than a year ago and is agreed that progress is being made; that reemployment will be gradual, but that we are now out of the woods.

For weeks now there has been much conjecture about the second session of the Seventy-fourth Congress. Will it be long or short? Will it confine its activities to strictly routine matters, or will it attempt to increase taxation, pass the bonus, revive the NRA, saddle industry with the 30-hour work week, and a multiplicity of other contingencies too numerous to contemplate? Well, Congress

is here. And what is ahead for it? If the officials of the Administration have their way, the session will be short and unnecessary legislation banned. It is certain that this is the President's objective. His message plainly told the Members of Congress to transact their business with all dispatch and return home. He said there was and is no necessity for any kind of increased taxation. However, three major factors are involved in any consideration of what Congress may or may not do.

First, the Supreme Court and its decisions upon the several New Deal cases to come before it, including the Agricultural Adjustment Administration, the Tennessee Valley Authority, the Bankhead Cotton Control, the PWA Slum Clearance and Low Cost Housing, the Wagner Labor Relations Law, and the Guffey Coal Control Law. The first decision, involving the constitutionality of the Three A's, was handed down on January 6, with an adverse ruling. The vote was 6 to 3, the dissenting Jurists being Justices Stone, Brandies, and Cardozo. This decision may result in substitute legislation, which may include a new tax measure.

Second is the question of relief, and the method of handling the present situation by the Administration. Undoubtedly a request of additional huge sums for relief will bring a storm of protest, with possibilities of prolonging the session many weeks. And third, the question of foreign relations which involves Neutrality Laws, reciprocal trade agreements and the St. Lawrence Waterway.

Unquestionably this session will be a "labor" session, in that Congress will be flooded with proposals of all kinds to bolster up labor's position. These include the 30-hour week, the Walsh Government contracts bill, and the O'Mahoney bill requiring a Federal license to engage in interstate business. The Walsh bill passed by the Senate in the last session, and the 30-hour week bill was reported favorably by committees in both Houses. Considerable pressure is anticipated for legislation of this type.

The death of Senator Schall gave to the Congress additional liberal strength. He was succeeded by Elmer A. Benson, formerly Minnesota's State Banking Commissioner. Senator Benson has been a Farmer-Laborite ever since that party came into existence. He advocates public ownership of monopolistic industries, and is a strong advocate of collective bargaining for labor. The Congress, as it now stands, includes Senate: 68 Democrats, 24 Republicans, 2 Farmer-Labor-

ites, 1 Progressive, and 1 vacancy; House of Representatives: 318 Democrats, 103 Republicans, 3 Farmer-Laborites, 7 Progressives, and 4 vacancies.

One of the major factors in the present session will be the imminence of the presidential campaign. This fact mitigates against a short session. History gives proof of that fact. Most pre-election sessions have remained in session to the very door of the party conventions, and after. They have proved stormy sessions, filled with as much demagogic politics as it is possible to crowd into the time.

Commentators are confident that the bonus will be paid. They point out that some \$2,000,000,000 in cash put into the hands of the doughboys will go a long way toward creating that air of prosperity that is so essential to any presidential campaign.

The President has promised a balanced budget if he can wangle it out of Congress. His message says that it "can be done." Just how we can continue to spend more than we make and still balance our budget remains to be seen, unless it is achieved in the same manner as Mr. Farley's Post Office budget which showed a five million profit, but did not take into consideration the seventy millions of subsidies chargeable to the Postal Service.

It is anticipated that the session will be enlivened by such dramatics as the showing of strength for the Townsend Plan, which asks a pension for all over 60 of \$200 monthly, to be expended each month and financed through a sales tax. It is not anticipated that this proposal will be other than diverting, and that its passage at this session is highly improbable, but undoubtedly it has sufficient adherents and strength to give Congress and the country cause of grave concern.

While proposals of this type may not receive action, it is quite possible that they will influence legislation and may in some instances force compromise enactments. One Washington commentator believes that the bonus legislation will be influenced by the "greenback" movement; that old age pensions will be influenced by the clamor for the Townsend Plan; that Father Coughlin and his radio following will have influence upon banking and credit legislation; and that the Frazier-Lemke farm debt refinancing plan will force a compromise on farm credit legislation.

But one thing and one thing only is certain: ANYTHING MAY HAPPEN at this session of the Congress. Industry's nerves are raw with too much Gov-

ernment cow-hiding; politicians are restive because this is an "election" year; the folks-at-home, those of them who know what half of it is all about, are annoyed, exasperated and a little heated by the fabulous spending programs, and are apt to demand an accounting. All in all, it looks like a great winter on the Potomac.

The following is a resume, sent out by The American Mining Congress, outlining bills of importance that will have congressional attention and which should have industry's attention:

S. 87—Thirty-hour Week; also H. R. 7198.

S. 2665—Change of Name of Department of Interior; also H. R. 7712.

S. 3055—Walsh Government Contracts Bill; also H. R. 9202.

S. 3154—Prohibiting Discrimination in Price Between Purchases; also H. R. 8442 (Patman Bill).

S. 3363—Business and Corporation Licensing Bill.

S. 87—*The Six-hour Day and Five-day Week Bill*, introduced by Senator Black, of Alabama, was the subject of extensive hearings before the Committee on the Judiciary. The bill would prevent the shipment in interstate commerce of articles and commodities produced by persons employed more than five days per week or six hours per day. The American Mining Congress organized an appearance before the Committee protesting the enactment of the bill. In this appearance a general statement was made by the secretary showing the effect of the bill upon all branches of mining, followed by special statements by representatives speaking for anthracite, lead, silver, and zinc. *Bill reported to Senate March 23, 1935.* The Committee on Labor of the House of Representatives considered a companion bill by Representative Connery (Dem., Massachusetts) and in its final action reported H. R. 7198 which is still a 30-hour week bill, but completely rewritten. It provides for a federal licensing commission consisting of the Secretary of Labor and

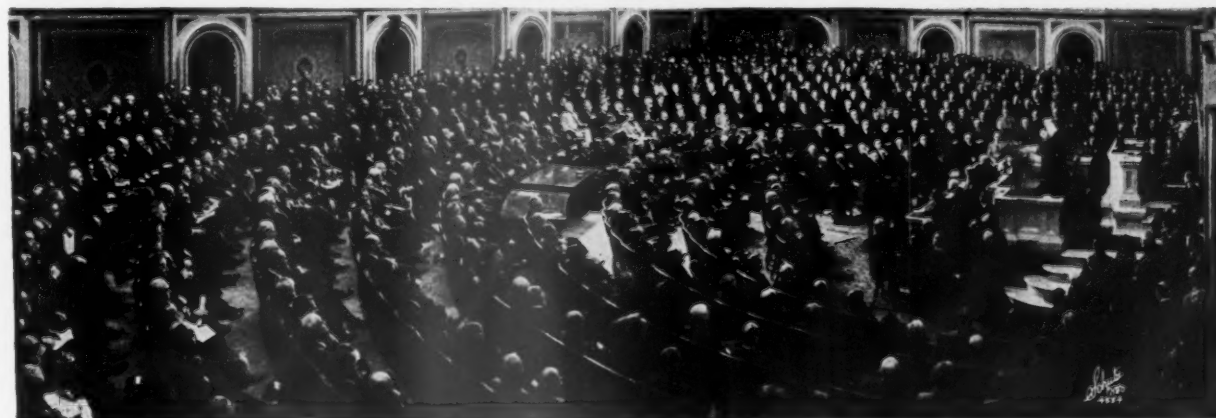
two members to be appointed by the President. One of the appointed members shall be a representative employer of labor who has participated in the activities of a national trade association which is affiliated with similar national trade associations, and one member shall be a representative of labor who has participated in the activities of a national labor union which is affiliated with similar national labor unions. The commission shall control and regulate interstate commerce through the issuance of federal licenses to those engaged in the production, processing, manufacturing, handling, or receiving of goods, articles, or commodities entering into interstate commerce. Requires as conditions for issuance of any license an agreement to limit hours of work to six hours per day and five days per week; payment of "a just and reasonable weekly wage sufficient to permit such workers to maintain standards of living of decency and comfort," in accordance with findings by the Commission; no employment of child labor; and collective bargaining provisions similar to Section 7a, NIRA, and Wagner Bill. Suspends conflicting provisions of the anti-trust laws. Has life of two years. This bill was reported on July 18, 1935, and now awaits the action of the Committee on Rules before being submitted to vote on the floor of the House.

S. 2665 and its companion, H. R. 7712 by Lewis (Dem., Illinois) and Cochran (Dem., Missouri) respectively, provides that the *Department of the Interior* shall hereafter be called and known as "The Department of Conservation and Works." It authorizes the President to transfer by executive order any commission, independent establishment, board, bureau, division, service or office, engaged in conserving the natural resources or in carrying on public work activities, to the Department of Conservation and Works. Such executive order shall be submitted to the Congress while in session and shall not be effective until after the expiration of 60 calendar days after such transmission, unless Congress shall, by law, provide for an earlier effective date. Authority of transfer granted to the President shall terminate in two years. *This bill reported by Committee on Ex-*

penditures in the Executive Departments to the Senate on July 24, 1935. There has been no action on this bill in the House.

S. 3055—*The Walsh Government Contracts Bill* passed the Senate August 12, 1935, and was referred to the House Committee on the Judiciary. A vote in this committee stood 13 to 7 against reporting the bill. Those members of the committee in favor of the bill then supported redraft introduced as H. R. 9202 by Representative Walter (Dem., Pennsylvania) but no action resulted. The bill officially before the House Committee is still S. 3055. It provides that in connection with all purchases or contracts for construction, supplies, materials or service (except personal service), also in any contracts or agreements made, extended, or modified hereafter and prior to June 30, 1937, by the United States or any agency thereof, for the loan or grant of funds, there shall be declared a covenant that will require that in the carrying out of projects or operations or in the production of supplies or materials or the furnishing of services in connection therewith, that there have been and will be paid, such minimum wages accompanied by such maximum hours of employment as shall be specified in such covenant, and further that no person under 16 years of age has been or will be employed in connection therewith. Further enforcement is provided by rendering the contracting party liable to the United States for liquidated damages in a sum equal to the minimum wage agreed to have been paid; that any sums due as liquidated damages may be withheld out of the monies due on the contract; that any breach may result in cancellation of contract; that representatives of the agency of the United States may inspect the relevant pay roll and time records of the person, firm, or corporation making the representation or agreement. It will be readily seen that this bill, if enacted, will in a material measure, restore the purposes of the NIRA.

S. 3154 by Robinson (Dem., Arkansas) is better known as the *Patman Bill* and is identical with H. R. 4482 by Patman (Dem., Arkansas). Contemplates the elimination of price differentials as



Note: That all bills pending at the adjournment of the first session (August 26, 1935) retained their status when the second session convened January 3, 1936.

between purchasers. Representative Patman's bill as amended contemplates that in purchases of materials in the amount of one or more carloads, there shall be no differential in price, except on demonstrated differences in cost of production or distribution. Bill vague and contradictory in its terms. For example, there shall be no differential in price between the purchase of one carload of coal and 1,000 carloads of coal. In the course of hearings conducted before the House Committee on the Judiciary on the Patman Bill, the American Mining Congress organized appearances by interested natural resource industries and the bill was not reported by the committee. There has been no action on S. 3154 in the Senate. The bill was intended by its authors to apply primarily to chain store food distributors but was so generally written as to include the natural resource products and supplies purchased by mining companies.

S. 3363 by Senator O'Mahoney (Dem., Wyoming) is a licensing bill sponsored by the American Federation of Labor. It increases the membership of the Federal Trade Commission from five to nine. Two of the additional commissioners are to be appointed by the President from a list submitted by a recognized national organization of employees, and two from a list submitted by a recognized organization of employers. After July 1, 1936, the bill would make it unlawful for any corporation or business to engage directly or indirectly in interstate or foreign commerce without having first obtained a license therefor from the commission; that no female employee shall be discriminated against as to rates of pay or rights granted; compliance with child labor provisions; compliance with equivalent of Section 7a of NRA and refraining from "unfair labor practices" of Wagner Bill. Commission in a 78-page bill is given widest powers in control of corporate and business enterprises, including development of "a general program for the coordination, stabilization, and orderly development of the specific industries of the United States and for a more equitable distribution of the earnings of commerce, trade and industry to those employed therein and to the investors of capital therein." There has been no action on this bill and it now lies in the Committee on Interstate Commerce, probably subject to pressure for action in the event that the Walsh government contracts bill does not move.

OTHER BILLS OF INTEREST TO MINING UPON WHICH ACTION HAS BEEN TAKEN

S. 575—*Location of Federal Domain Surface for Mining* — Borah (Rep., Idaho). Committee on Mines and Mining. Amending the Mining Act of May 10, 1872, as amended; permitting locations on the Federal domain in vicinity of mining districts for mill sites or any enterprise necessary to mining, including landing fields and airports. Requirement of \$1 per acre per year to apply on purchase price of land, which shall

not exceed \$5 per acre in total. *Passed Senate January 30, 1935. Referred to House Mines and Mining Committee, February 1, 1935.*

S. 1476—*Government to Mine Gold and Rare Minerals*—Pope (Dem., Idaho). Committee on Mines and Mining. Authorizes Director of U. S. Bureau of Mines in cooperation with the Federal Emergency Relief Administration to mine, mill, smelt and recover gold and all other rare and non-competitive minerals except in case of deposits where the principal product would be iron, lead, zinc or any other metal of which there is deemed to be domestic overproduction or overdevelopment. Mining may be on publicly or privately owned or controlled properties with the consent of the owner thereof. Director shall pay royalties to private owners, not exceeding 50 percent of operating profits. Government to be reimbursed from earnings for cost of mining, milling, and smelting operations and construction charges. Rates of pay not less than wages for similar work in the vicinity, with due regard to rates established through collective bargaining. Persons employed come under Federal Employees Compensation Act of September 7, 1916. Transfer of \$100,000,000 of funds appropriated by Congress for relief purposes. Revenue derived by the Bureau of Mines from mining operations placed in special fund by the Treasury Department for further use, pursuant to the provisions of this act. As this bill now stands on the Senate calendar, it embodies certain amendments, namely, the statement of purposes and policy, to avoid competition with existing mineral and metallurgical industries now placed in the opening section and is specifically referred to in later sections in which the Director of the Bureau of Mines is authorized to engage in mining and recovery of gold, silver and deficient and non-competitive minerals; Director required to publish results of examination of mineral deposits as quickly as possible for information of prospectors and others, except where interference might result through locations under the mining laws; in case development of any mineral property by the government indicates that its principal production is lead, zinc, copper, iron, or other metals or minerals, of which there is overproduction or overdevelopment, government shall not operate any such property but shall hold it as a reserve until overdevelopment no longer exists and then dispose of it by lease or sale to the highest bidder; no new construction of treatment plants of any kind to be commenced more than three years after effective date of act; "non-competitive minerals" defined as such of which there is not a surplus in the United States, and for which there is, at all times, a market not in competition with domestic producers; Director authorized to explore by core drilling or other means the deposits contemplated in the act; Director is authorized to repair old roads and construct new roads to mining camps. *Reported to Senate May 7, 1935.*

S. 2424—*Bureau of Mines Experiment Station, Salt Lake City*—King (Dem., Utah). Committee on Mines and Mining. Provides for the establishment and maintenance of a central research and experiment station. (Similar to a bill in 73rd Congress.) Terms the proposed station a "central research and experiment station, and arranges for the transfer of the power, records, property, personnel and appropriations of the present Salt Lake station only. Appropriates \$50,000 for 1936 and annually thereafter.

Note: The bill includes inquiries and investigations into oil, gas and hydrocarbons which are specifically excluded in H. R. 2853, Murdock (Dem., Utah). *Reported to Senate August 21, 1935.*

S. 2638—*Unallotted Indian Lands for Mining Purposes*—Thomas (Dem., Oklahoma). Committee on Indian Affairs. Amends law covering the leasing of unallotted Indian lands for mining purposes by providing for 10-year leases by authority of Tribal Council subject to approval of Secretary of Interior. Provided that such unallotted Indian lands, other than lands of any of the Five Civilized Tribes and the Osage Reservation, subject to lease under the provision hereof, may be leased at public auction by Secretary of the Interior with the consent of the Tribal Council for oil and/or gas mining purposes for 10 years and thereafter to exhaustion. Further, power of tribes to lease lands for mining purposes under Sections 16 and 17 of the act of June 18, 1934 (45 Stat. 984) shall not be restricted. Identical with H. R. 7681, Rogers (Dem., Oklahoma). *S. 2638 passed Senate May 29, 1935; referred to House Indian Affairs Committee May 31, 1935.*

S. 2925—*Creating National Planning Board*—Copeland (Dem., New York). Committee on Commerce. Composed of five members and authorized to investigate, examine, study, analyze, assemble and coordinate and periodically to review and revise basic information. Appropriate to plans or planning policies for the conservation and development of the "natural, human, and other resources of the nation," and on the basis thereof to advise with existing agencies of the federal, state and local governments. National Resources Board created by executive order, June 30, 1934, abolished at discretion of the President. *Reported to Senate June 27, 1935.*

S. 3260—*Amending Silver Purchase Act*—McCarran (Dem., Nevada). Committee on Agriculture and Forestry. Repeals sections 6, 7 and 8 of Public Law No. 438, 73rd Congress, and declares null and void and inoperative all Treasury rules and regulations made in pursuance thereof. Sections which would thus be repealed are those providing for nationalization of silver, and tax of 50% on profits from silver transactions. *Passed Senate August 24, 1935.*

H. R. 6450—*Labor Representatives on Federal Boards*—Connery (Dem., Massachusetts). Committee on Labor. In the administration of laws by boards,

commissions and agencies of the government the President is authorized and directed to provide for the participation upon all such boards, etc., of a number of representatives of national trade unions equal to the number of employees serving thereon. *Reported to House March 8, 1935. Union Calendar 93.*

H. R. 7322—Bureau of Mines Experiment Station, Salt Lake City, Utah—Similar to S. 2424, King (Dem., Utah). H. R. 7322 reported May 15, 1935. Union Calendar 316.

H. J. Res. 148—State Compacts Affecting Labor and Industries—Amended to require requests by the states negotiating under the act before the President may designate a representative to attend such negotiations. Passed House April 1, 1935.

FURTHER BILLS OF INTEREST TO MINING UPON WHICH NO ACTION HAS BEEN TAKEN

S. 416—Import Duties on Coal and Coke—Davis (Rep., Pennsylvania). Committee on Finance. Provides duty of \$4.00 per 2,000 pounds upon coal, coke or coal or coke briquettes.

S. 487—Purchase Surplus Copper—Ashurst (Dem., Arizona). Committee on Mines. Provides for appropriations of \$200,000,000 for purchase in the open market of surplus copper metal produced from ores mined within the United States.

S. 573—Estopping Common Carriers from Transporting Products of Their Own Production—Borah (Rep., Idaho). Committee on Interstate and Foreign Commerce. Amending Paragraph 8 of Section I, Interstate Commerce Act, by prohibiting after January 1, 1936, interstate or foreign transport of any article or commodity manufactured, mined or produced by common carriers or under their authority or which they may in whole or in part or in which they may have any interest, direct or indirect, through stock ownership, or use, interlocking directors or officers, or other lawful means.

S. 579—Corporation Licensing Act of 1935—Borah (Rep., Idaho). Committee on Judiciary. Federal Trade Commission to license corporations engaged in Interstate or Foreign Commerce denying application if deemed "an unlawful trust or combination in violation of the anti-trust laws." Full powers of investigation and penalties for non-compliance.

S. 1518—Six-Hour Day for Employees of Interstate Carriers—Black (Dem., Alabama). Committee on Interstate Commerce. Provides six-hour day for employees of carriers engaged in interstate and foreign commerce, including those of express, freight forwarding and

sleeping car companies. Wage to remain same as for present day.

S. 1853—Maximum of 3 percent for Depreciation—Bulkley (Dem., Ohio). Committee on Finance. Amends Revenue Act of 1934 by adding at the end of Section 23 (1) the following: "The aggregate allowance under this subsection in the case of all property subject to wear and tear shall in no case exceed 3 per centum of the adjusted basis of such property as of the beginning of the taxable year, plus the cost of property subject to wear and tear acquired during the taxable year and the cost of additions and betterments made during the taxable year to property subject to wear and tear." And also by adding after the words "but not less than the amount allowable" in Section 113 (b) (1) (B) the following: "Computed without reference to the last sentence of section 23 (1)."

SOUP'S ON!



—The Washington News

S. 1941—Excise Tax on Net Capital Return—Wheeler (Dem., Montana). Ordered to lie on the table. Levies excise taxes upon "net capital return" of corporations (eliminating payments for interest and dividends received as deductions) tax rate 2 percent for net capital returns from \$3,000,000 to \$3,500,000, ranging up to 25 percent for net capital returns in excess of \$50,000,000. Does not repeal present taxes under the Revenue Act. Federal Trade Commission to study and report on relation between total resources of corporation and their efficiency, with view to determining desirable maximum size of corporations in different classes of business.

S. 2199—Reasonable Regulation of Competition in Trade—Nye (Dem., North Dakota). Committee on Finance. Provides that it shall not be lawful for persons to cooperate by written agreement for the reasonable regulation of competition in trade. Authorizes Federal Trade Commission (1) to approve or disapprove agreement in whole or in part; (2) to supervise the effect of said agreement in operation; (3) to declare as unfair competition any practice or method which may be condemned as unfair when signed by substantial number engaged in any branch of industry or trade when such a practice or method may exist or which may be affected thereby and (4) at any time, upon due notice, in the public interest, to abrogate said agreement in respect to any provision therein which the Federal Trade Commission may deem to be contrary to the maintenance of fair competitive conditions based on sound economic principles.

S. 2232—Repealing Foreign Trade Agreements and Authority Therefor—McCarran (Dem., Nevada). Committee on Foreign Relations. "That Section 350 of the Tariff Act of 1930 (relating to reciprocal trade agreements) is hereby repealed; and no foreign trade agreement heretofore entered into under such Section 350 shall have any force or effect after the enactment of this act."

S. 2427—Erect and Operate Custom Mills—McCarran (Dem., Nevada). Committee on Mines and Mining. Authorizes and directs Secretary of Interior to provide for erection of custom mills for treatment of gold and silver bearing ores; mill locations to be selected by the Secretary; appropriation of \$50,000,000 to be recovered through operating contracts either with public or private agencies. If the Secretary is unable to negotiate such contracts he is authorized and directed to operate such mills.

S. 3046—Unemployment-Benefit Contributions Deductible from Gross Income—Duffy (Dem., Wisconsin). Committee on Finance. Amends Revenue Act of 1934 as follows: "An employer subject to an unemployment-benefit law of any state, territory, or possession, or the District of Columbia shall be allowed as a deduction all amounts contributed by him during the taxable year to an unemployment fund established in conformity with such law."

S. J. Res. 3—Regulating Hours, Wages and Production—Costigan (Dem., Colorado). Committee on the Judiciary. Proposing an amendment to the Constitution of the United States empowering Congress to regulate hours and conditions of labor and to establish minimum

wages in any employment and to regulate production, industry, business, trade and commerce to prevent unfair methods and practices therein. Such amendment would remove limitations of the due process clauses of the Constitution with respect to such legislation.

S. J. Res. 28—State Compacts Affecting Labor and Industries—Walsh (Dem., Massachusetts). Committee on Judiciary. Similar to H. J. Res. 146.

H. R. 1403—Publicity of Regulations and Orders—Lewis (Dem., Maryland). Committee on the Judiciary. Provides that all executive and administrative rules, regulations and orders, violation of which may result in civil or criminal liability, shall be filed with the Secretary of State and shall not be effective until five days after such filing. Shall become public records freely open to inspection by any citizen and shall be published in the same manner as the Acts of Congress.

H. R. 2733—Suspension of Immigration—Blanton (Dem., Texas). Committee on Immigration and Naturalization. That for the period of 10 years beginning 30 days after enactment, the immigration of all aliens into the United States is prohibited.

H. R. 2769—Land Patent Gold Bearing Gravels—Englebright (Rep., California). Committee on Public Lands. To authorize the issuance of patent for lands containing gold bearing gravels, at depth, which are overlaid by volcanic lava.

H. R. 2853—Bureau of Mines Station, Salt Lake City—Murdock (Dem., Utah). Committee on Mines and Mining. Provides for research station. Similar to S. 2424.

H. R. 3001—Embargo on Petroleum Imports—Stubbs (Dem., California). Committee on Ways and Means. Prohibits until the end of the calendar year 1940 the importation of crude petroleum and crude petroleum products.

H. R. 3048—Prohibiting Employment of Aliens—Stubbs (Dem., California). Prohibits employment of aliens without express and special federal authorization, while there are American citizens out of work, to be administered by a bureau in the Department of Labor. Committee on Labor.

H. R. 3068—Import Duties on Coal and Coke—Turpin (Rep., Pennsylvania). Committee on Ways and Means. Provides duty of \$4.00 per 2,000 pounds upon coal, coke, or coal or coke briquettes from any foreign country. Same as S. 418.

H. R. 3977—Townsend Old-Age Revolving Pension Act—McGroarty (Dem., California). Committee on Ways and Means. Every citizen 60 years of age and over to receive, upon application and qualification, a pension of not over \$200 per month during life. Levy of 2% on gross dollar value of each business, commercial and/or financial transaction done within the United States. Pension must be spent within 30 days for goods, commodities or services within the juris-

diction of the United States; not more than 15% for charity, church and fraternal organizations. Administration under Secretary of the Treasury.

H. R. 4010—Erect and Operate Custom Mills—Scrugham (Dem., Nevada). Committee on Mines and Mining. Identical with S. 2427.

H. R. 4744—Import Tax, Petroleum—Sanders (Dem., Texas). Committee on Ways and Means. Amends Section 601 (c), Revenue Act of 1932, by increasing tax on imported petroleum and derivatives except gasoline and lubricants from $\frac{1}{2}$ cent to 1 cent per gallon. Adds tax on imported asphalt of \$2 per ton.

H. R. 4508—Public Lands for Camp Site, Refining Works, other Purposes—DeRouen (Dem., Louisiana). Committee on Public Lands. Same as S. 1477.

H. R. 5424—Reciprocal Tariff—Andrews (Rep., New York). Committee on Ways and Means. Amends Section 350, Tariff Act of 1930 by adding "(d) No foreign trade agreement entered into under this section shall be effective unless such agreement is concluded by and with the advice and consent of the Senate as in the case of treaties."

H. R. 6098—Building Roads to Mineral Claims—White (Dem., Idaho). Committee on the Public Lands. Appropriates \$1,500,000 for fiscal year 1936 and same for fiscal year 1937, for construction of roads in national forests when examination of mineral claims by qualified representative of U. S. Geological Survey proves existence of mineral value sufficient to warrant.

H. R. 6229—Maximum of 3 percent for Depreciation—Lamneck (Dem., Ohio). Committee on Ways and Means. Identical with S. 1853.

H. R. 6366—Repealing Foreign Trade Agreement and Authority Therefor—Scrugham (Dem., Nevada). Committee on Ways and Means. Identical with S. 2232.

H. R. 6808—Immigration Quota, Mexico and Philippine Islands—Repeals Subdivision 4 (c) of the Immigration Act of 1934 as amended and eliminates thereby the classification of "non-quota countries." This makes all provisions of the immigration law relating to numerical limitation applicable to persons born in Canada, Newfoundland, Mexico, Cuba, Haiti, Dominican Republic, Canal Zone and in any independent country of Central or South America. Annual quota to be 30% of the visas issued year ending June 30, 1930, provided that quota for Mexico shall not exceed 1,000; Philippine Islands to have quota of 50.

H. R. 6993—Limiting Entry of Foreign Goods—Connery (Dem., Massachusetts). Committee on Ways and Means. Limits importations competitive in the American market where "landed costs" are less than costs of production and delivery of comparable American goods. To be administered by Secretary of Treasury. All imports must be accompanied by sworn statement that total "landed costs" are not less than American costs of comparable goods. Section

3 provides that on complaint of representatives of workers employed in American production or mining, Secretary is authorized to refuse entry to such foreign goods until after he has made an investigation and ascertained that total "landed costs" were not less than production costs of comparable American articles.

H. R. 7232—Import Duties—Coal and Coke—Turpin (Rep., Pennsylvania). Committee on Ways and Means. Levies duty of \$4 per 2,000 pounds "notwithstanding any treaty provisions" upon coal "anthracite or bituminous" including culm and duff, coke, or coal or coke briquettes.

H. R. 7454—Silver Seigniorage Charges—Scrugham (Dem., Nevada). Committee on Coinage. Provides that "until either the domestic price of silver has reached \$1.20 per ounce or the President has proclaimed that the national emergency recognized by various acts of the 73rd and 74th Congresses has ceased to exist (whichever is the earlier) no seigniorage or other mint charges shall be retained by the Director of the Mint on silver mined from domestic natural deposits, provided (a) That the owner of the silver received at the mint is the miner thereof; (b) that such owner contracts with the Secretary of the Treasury to expend the amount which would, except for this act, have been retained as seigniorage or other mint charges in the following manner: (1) At least $\frac{1}{2}$ of such amount for the payment of wages to men employed on underground development work undertaken subsequent to the date of enactment of this act; (2) The remainder of such amount for the payment of wages for renovation, construction or installation of plant and equipment, undertaken subsequent to the date of enactment of this act; and further (c) Such owner contracts to expend in addition an amount equal to 50% of the amount which would, except for this act, have been retained as seigniorage or other mint charges, for labor, materials, equipment, power, and other ordinary expenses in connection with such new development work, or in connection with such renovation, construction, or installation of plant and equipment.

H. R. 7480—To Fix Standard of Value and Regulate Coinage—Murdock (Dem., Utah). Committee on Coinage. The dollar shall consist of eight grains of gold bullion, 9/10 fine, plus 128 grains of silver bullion, 9/10 fine. Treasury authorized to purchase and sell gold and silver and issue "U. S. Treasury Certificates." All reserves of gold and silver shall be kept in the form of bullion, except necessary subsidiary coins required for trade and commerce.

H. R. 7675—Domestic Production—Tin and Strategic Materials—McReynolds (Dem., Tennessee). Committee on Ways and Means. Declares tin to be a strategic mineral. Creates Board for Strategic Materials of seven members—Two Senators, two Representatives, one State Department official, one Army of-

(Concluded on page 52)

FACE PREPARATORY PRACTICE

at NO. 2 KNOX CONSOLIDATED COAL CORP.

By THOMAS JAMES*

WHILE the dictionary has two entirely different definitions for "safety" and "efficiency," experience has proved to the Knox Consolidated Coal Corp. that working "safely" means working efficiently. Therefore, while this is a discourse on the face preparatory practice of this company, it is logical to assume from the above statement that "safety" in this phase of our mining operations, as in all other phases, is our first consideration.

With this in mind, the unit boss, accompanied by a timberman and jerryman, enters a room as the loading unit leaves it. Loose top is taken down or timbered. Face and ribs are sounded and any loose coal, bumps, or overhangings is taken off and thrown back out of the way, in preparation for the cutting machine. The face is timbered in a "V" with the farthest prop 18 ft. from the face, and not closer than 3 ft. from the track. This, regardless of whether the top is good, bad, or medium. After the unit boss is satisfied that the room is entirely safe, the cutting machine is brought in. The room is sighted before the unit boss leaves.

We use the Goodman shortwall machine. The rooms are 30 ft. wide, on 53-ft. centers. Breakthrus are driven 20 ft. wide at 40-ft. centers in staggered arrangement. As there are no pillars drawn, rooms are widened 10 ft., after the third breakthru is passed. The machines cut a full 6½ ft., being equipped with 7-ft. cutter bars. All machine bits are gauged as to length, when being set, and are carried loose on the machine in leather buckets, in traveling from one place to another. Square ribs are cut as much as possible, although we have reasonable success in cutting the first cut in breakthrus with a rounding cut. Gripping cuts, except in case of absolute necessity, are avoided. The cuttings are shovelled away from the machine during the cutting operation, and if by chance

the machine should cut in the clay, the machine helper throws such cuttings in the gob. The machine men are careful not to leave any bits in the slack.

The face being cut, it is again examined by the unit boss, and, if found safe, the drill is brought into the room.

We use the Chicago pneumatic, one-man drill, which, together with the necessary equipment, is carried on a light truck and pushed from place to place by hand. Two men comprise the drilling crew unit. While one is drilling, the other is preparing the shots and tamping the holes. The holes are drilled as straight in as possible. Lifting or gripping shots are not permitted. They are so spaced as to give five top holes to 30-ft. face. Top and bottom holes are drilled. The top holes, about 6 in. from the roof, and the bottom, not more than a foot above the kerf. The bottom holes are used for snubbing, which will be discussed later. All holes are scraped free of dirt and the charge placed in the hole. Before the holes are charged, they are measured for depth by the unit boss. Top holes must be within 6 in. from the back of the undercut. Bottom holes are 4 ft. deep. The top holes are charged according to the characteristics of the coal. In some sections three sticks of permissible powder is the charge. Other sections use two or two and a half sticks. Four clay dummies are used for tamping. The first dummy is not tamped, but the next three are tamped as solid as possible. Fuse is used exclusively, the length of which determines the proper sequence in which the holes are fired. Bottom holes are charged with one stick of light or bulky permissible.

In the next phase of our practice, all the bug dust is cleaned out from the kerf. This leaves the face ready for the next phase, which is snubbing.

The snubbing and shooting is done on the night shift, two men comprising the snubbing crew for two units.

The snubbing is done with pans, which are generally made from old

screen plate material reinforced with 2-in. angles, welded on the top side. So constructed, the pans, when withdrawn, grip the coal which is shot down on them, and, in addition, are lighter in weight and easier to handle than solid plate. A chain is fastened to the front end and made long enough to be in the clear after the snubbing shots are discharged. The pans are approximately 5½ ft. long and 3 ft. wide. They are carried on a truck together with the necessary pulling ropes, chains, etc., and are moved from place to place with a motor, manned by the snubbing crew. The pans are placed under the cut and pushed to the back. Nine pans are required for a 30-ft. room, or more if wider. With the pans in place, the bottom shots are fired, the snubbing crew retiring to a safe distance until after the detonation. As soon as it is safe to return to the face, the snubbing crew pulls the pans, two at a time, using motor and ropes and chains furnished for the purpose. When the pans are pulled, the coal which has been shot down on them is pulled with them, making an ideal snubbed face.

With this operation completed, the same crew lights the top shots and goes to the next place.

The next phase of preparation takes place on the following day. In this phase, all the places shot down are sprinkled with water. A pipe line is provided in every third place with necessary branches in the breakthrus.

Water pressure is maintained by connection to a pump discharge line discharging water to the surface through a convenient drill hole provided for the purpose. One hundred feet of 1-in. hose is attached to the nearest pipe line and the dislodged coal is well wetted to reduce the dust during loading, which is done with machines.

Before the loading unit enters, the place is again examined by the unit boss. Should any draw slate or loose roof have been dislodged by the shots, this is removed before loading. There is no further attempt made to clean the coal underground, other rock and impurities being separated from the coal in the tipple.

* Mine foreman, Knox Consolidated Coal Corp.

Mechanization Trends

WHILE many coal companies have been compelled to spend much time in Washington in relation to the Government's proposals to "save" the industry, their operating personnel have not placed their faith in political expedients and have been busily engaged in finding ways and means to reduce their production costs, through the application of modern mining methods and machines.

The operators committees of The American Mining Congress, sponsored by and a part of its Coal Division, have been actively organizing and gathering data, preliminary to a meeting to be held at the William Penn Hotel, Pittsburgh, Pa., January 30-31, and February 1, 1936. These groups are compiling data to show the best mining practice used in all of the principal coal fields of the United States, and their studies include the major phases of coal mine operation.

Several months ago specific subjects were selected for these studies. A number of preliminary reports have been prepared and others are in the process of preparation. These reports indicate that a vast amount of information, valuable to every coal mining man, is available from the companies represented on the committee membership. The purpose of the Pittsburgh meeting is to discuss the preliminary reports that have already been submitted, and to arrange for the proper coordination of the data being compiled by each district chairman, so that the completed project

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F. E. Gleason, U. S. Fuel Co.
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Garner Williams, Cabin Creek Consolidated C. Co.
E. N. Denham, Mining Engineer, Williamsburg
R. A. Woodburne, Louisville Gas & Elec. Co.
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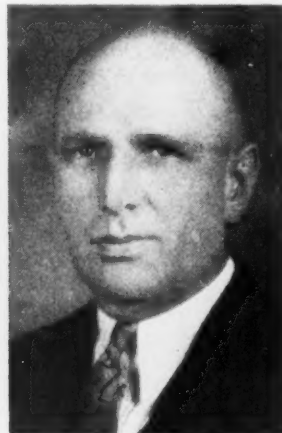
F. S. Follansbee, Koppers Coal & Trans. Co.
T. M. Hoar, Bethlehem Mines Corp.
Earl Griffith, Pruden Coal & Coke Co.
Geo. T. Wall, Carbon Fuel Company
H. J. Nelms, Ohio & Penna. Co.
S. M. Cassidy, Saxton Coal Mining Co.
Albert Evans, C. C. B. Smokeless Coal Co.
W. G. Duncan, Jr., W. G. Duncan Coal Co.
Gomer Reese, Kemmerer Coal Co.
A. H. Reeder, Stonega Coke & Coal Corp.
G. A. Schultz, Liberty Fuel Co.
H. A. Treadwell, C. W. & F. Coal Co.
Thomas Donelson, Hardy-Burlingham Mng. Co.
P. H. Weise, South Fayette Coal Co.



C. W. Connor



H. H. Taylor, Jr.



C. F. Keck



Carl Lee

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Frank V. Hicks, Union Pacific Coal Co.
N. Morris, Sahara Coal Co.
R. C. Thomas, North East Coal Co.
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Leslie S. Voltz, American Eagle Colliery
P. L. Donie, Little Betty Mng. Corp.
P. C. Graney, C. C. B. Smokeless Coal Co.
T. F. Christian, West Ky. Coal Co.
T. E. Jenkins, National Fuel Co.
W. N. Wetzel, U. S. Fuel Co.
D. D. Wilcox, Superior Coal Co.
F. B. Dunbar, Mather Collieries

Chairmen of the District Committees

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M. D. Cooper, Hillman Coal & Coke Co.
D. D. Dodge, Uniontown, Pa.
W. W. Dartnell, Valley Camp Fuel Co.
H. B. Husband, C. & O. Fuel Mines
R. H. Morris, Gauley Mountain Coal Co.
J. L. Osler, Blackwood Coal & Coke Co.
J. F. Bryson, Harlan Co. Coal Opers. Assn.
W. J. Borries, Dawson Daylight Coal Co.
R. V. Clay, Hanna Coal Company
P. L. Donie, Little Betty Coal Mng. Co.
R. J. Oldham, Centralia Coal Co.
G. B. Pryde, Union Pacific Coal Co.
Otto Herres, U. S. Fuel Company
L. C. Skeen, Fordson Coal Company



E. J. Newbaker

reports will render the maximum service and be fully representative.

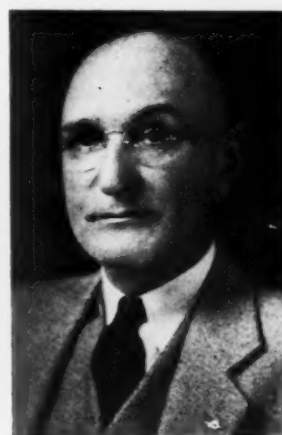
The Pittsburgh conferences promise to be most interesting. The chairmen of the district and project committees, including the national chairman and district subcommittee chairmen, are preparing reports to be submitted at that time. Each group will hold a separate conference, and the entire committee will be brought together in final session for coordination. The topics to be discussed by the group conferences are as follows: Face Preparatory Work; Power; Transportation; Loading; Surface Preparation; Safety; Mine Maintenance; and Mining Systems. Each subject is assigned to a national committee, and to a district subcommittee, each of whom will report their findings to the full committee. At the Friday morning session, January 31, the group, which is anticipated will number a hundred or more operators, will divide itself into topic sections, each considering its special subject and hearing reports from committees from each district, comparing data



T. W. Guy



C. C. Ballard



Wm. Crichton, Jr.



I. N. Bayless



F. F. Jorgensen



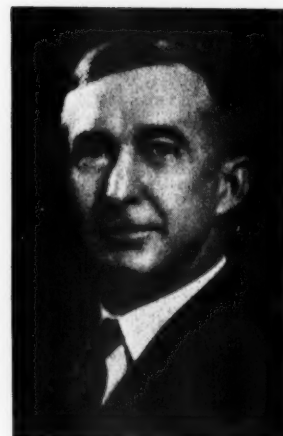
M. W. Horgan



C. W. Gibbs



T. F. McCarthy



J. F. MacWilliams

from the districts, and will determine the recommendations which will be made to the general meetings.

On Friday afternoon reports and discussions will cover the following operations: Cutting Bit Treatment; Mechanical Loading; Conveyor Mining; Accident Prevention; and Mining Systems. On Saturday morning the subjects to be covered will be Gathering Haulage; Power Distribution Underground; Mine Fan Testing; and Dewatering Small Sizes of Washed Coal.

While all of these discussions are preliminary, it is anticipated that a good start will have been made toward the finally completed project, which contemplates the compilation of data on every phase of operating practice. The men who are the members of this group are thoroughly qualified to make the studies, and it is an assured fact that their final contribution of operating technique will be of vast importance.

● THE NATIONAL RESOURCES COMMITTEE reported to the President December 23, on regions in America as a basis for planning to meet problems involving Federal and state powers. The committee report advocated "not Balkanization of America," but cooperative use of state and Federal powers on a subnational basis to attack planning problems involving more than one state.

The report on regional factors in national planning and development follows the recently issued document on state planning and shows the inadequacy of state powers to meet pressing problems of water use and control, land use, erosion, and mineral policies overlapping state lines. In the opinion of the National Resources Committee these regional planning problems should be handled on a decentralized basis.

The principal recommendations of the committee include: (1) continued support by the Federal Government of state planning; (2) the establishment as

needed of regional planning commissions like those in New England and the Pacific Northwest; (3) the encouragement of further use of interstate compacts as a means of solving regional problems wherever this is feasible; (4) consideration of the advantages of Federal authorities of a regional-functional nature, such as the Tennessee Valley Authority, as a means of dealing with some types of subnational problems; (5) the adoption of a general policy that comprehensive planning should precede development programs; (6) the establishment of a permanent advisory National Planning Board responsible directly to the President and charged with the duty of preparing plans and general policies, stimulating and encouraging regional and state planning, and advising the President on progress and development of planned proposals; (7) the establishment of a permanent National Development Administration based upon the powers, duties, and functions of the

Emergency Administration of Public Works, the Works Progress Administration, the Allotment Committee, and the Federal Employment Stabilization office; (8) the use of a variety of methods for construction and development of regional projects as adequate planning may suggest or the Development Administration may find appropriate or expedient; and (9) pointing Federal policy so as to bring down the 108 different sets of field districts in use by Federal agencies to a limited number of regional centers, say 10 to 12.

● THE UNIVERSITY OF ILLINOIS announces the 1936 Short Course in Coal Utilization, to be held at Urbana on June 9-10-11. Detailed program will be available about April 15 from Prof. A. C. Callen, head of the Department of Mining and Metallurgical Engineering, who will again be in charge of the course. Last year's short course was attended by 215 coal men from 18 different states.

News and Views

of Interest to Mining Men

● **LANDS** in Western States, formerly closed to location and sale in an Executive order by the President some time ago, are now again open as the result of a new Executive order amending the former one. The announcement was made this week by Secretary of Interior Ickes. The new order permits the sale or lease under certain provisions of the Taylor Grazing Act, of public lands capable of yielding metals and non-metallic ores in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, and Wyoming. The sale or lease is subject to the opinion of the Secretary of the Interior in deciding if they are needed for any public purpose. The order includes all vacant and unappropriated public land in the states mentioned, valuable for either metallic or non-metallic deposits, and makes them subject to location under the mining laws of the United States.

● **AT THE** seventh annual meeting of the Illinois Coal Operators Association, held in Chicago, December 12, the following were reelected as members of the executive board for another year: D. W. Buchanan, Charles F. Hamilton, George B. Harrington, Carl T. Hayden, William J. Jenkins, M. F. Peltier, Fred S. Pfahler, C. J. Sandoe, T. J. Thomas, Paul Weir. O. M. Gordon was reelected treasurer for another year.

Immediately following the close of this meeting the executive board met and organized and reelected William J. Jenkins as chairman. The board also reelected the following officers and general counsel for the next year: President, William J. Jenkins; secretary, Fred S. Wilkey; general counsel, Thurlow G. Essington.

● **MEMBERS** of the Advisory Committee to the Coal Commission which held meetings continued with conferences the past week in an effort to iron out differences in fixing classifications and minimum prices for Area No. 1. Drafting of rules and regulations for guidance of the district boards in this area, concerning coal handling, wharfage and dock handling, and other matters are also being considered preparatory to the fixing of prices. Latest advices are that the mine prices for Area No. 1 will not be fixed until January 1. Meanwhile minimum prices have been fixed for Areas Nos. 14, 16, and 17, and are as follows:

The minimum price schedule for the Arkansas-Oklahoma territory (District 14) includes prices effective as of November 26 and, as in the case of all areas,

is based on free-on-board mine prices per ton. The price schedule varies from 75 cents per ton for slack to \$4.60 per ton for furnace-egg coal, and \$7 per ton for sacked smithing coal in carload lots.

For the northern Colorado area (District 16) prices effective as of December 6, the schedule embraces prices ranging from \$1.65 per ton for slack to \$4.75 per ton for lump.

In the southern Colorado area (District 17) prices range from \$1 per ton for slack to \$4.35 per ton for lump. The

**TOO BAD THERE ISN'T ENOUGH
HOT WATER TO GO 'ROUND**



top price for the New Mexico Area (District 18) is \$4.50 per ton for lump coal.

The full advisory committee includes two score men active in the coal industry but functioning solely in an advisory capacity. This group has, in turn, appointed a subcommittee, titled the Committee on Coordination for Minimum Price Area No. 1, consisting of W. A. Richards, chairman, L. G. Ball, and E. G. Mathiott.

The Coal Commission also has announced a complete list of coal producers in the 23 producing areas comprising several hundred producers who have signed the coal code. Copies of this list have been forwarded to all Government departments for use in connection with coal purchases. Also announced are the rules of procedure which will govern the conduct of the Commission's sessions and

hearings, and the handling of all complaints, protests, and petitions for relief.

● **OF SIGNIFICANCE** in connection with the Guffey Coal Act was the report made public this week by the Nation Lawyer Committee of the American Liberty League, holding the Bituminous Coal Conservation Act unconstitutional. The report is the second issued by the lawyers' committee, its first concluding that the Wagner-Connelly Labor Relations Act was invalid.

The committee gave as reasons for its conclusions as to the Coal Act:

"1. The act is unconstitutional in that it undertakes to regulate activities which are essentially and inherently local in character, and which cannot be brought within the Federal power by congressional declaration that they 'directly affect' interstate commerce.

"2. The act is unconstitutional in that it capriciously and arbitrarily infringes upon the individual liberties of producers and employees.

"3. The act is not rendered constitutional by a pretended exercise of the taxing power through the assessment of that which is not, in fact, a tax but a coercive penalty.

"4. The act is not rendered constitutional by congressional declaration that the industry is 'affected with national public interest' and that 'the general welfare of the nation' requires such regulation."

The report was prepared by a subcommittee consisting of William Beye, of Chicago, chairman; John J. Heard, of Pittsburgh; Forney Johnston, of Birmingham; and Frederick H. Stinchfield, of Minneapolis.

● **THE INVITATION** extended by President Roosevelt to hold the Third World Power Conference in this country has been accepted by the International Executive Committee and the date has been set for September 7 to 12, 1936, at Washington, D. C. It is understood that the theme of the Washington meeting will be "National power economy," and regional planning, fuel conservation, and water power will be among the subjects discussed.

● **THE** output of gold, silver, copper, lead, and zinc from mines in Arizona in 1934, in terms of recovered metals, was 167,024.12 fine ounces of gold, 4,448,474 fine ounces of silver, 178,082,213 pounds of copper, 6,877,216 pounds of lead, and 1,810,279 pounds of zinc, according to C. N. Gerry and Paul Luff of the United States Bureau of Mines, Mineral Resources, Salt Lake City office. Comparative figures for 1933 were 79,992.61 ounces of gold, 2,390,363 ounces of silver, 114,041,781 pounds of copper, 3,442,540 pounds of lead, and 11,024 pounds of zinc. The value of gold production increased from \$2,044,611 in 1933 to \$5,837,493, silver from \$836,627 to \$2,875,781, copper from

\$7,298,674 to \$14,246,577, lead from \$127,374 to \$254,457, and zinc from \$463 to \$77,842. The value of the five metals increased from \$10,307,749 in 1933 to \$23,292,150 in 1934, or \$12,984,401. The value of the metal production in Arizona from 1903 to 1934 was \$2,556,371,201, of which 90 percent represent the value of copper; 4.71 percent the value of gold; and 3.86 percent the value of silver.

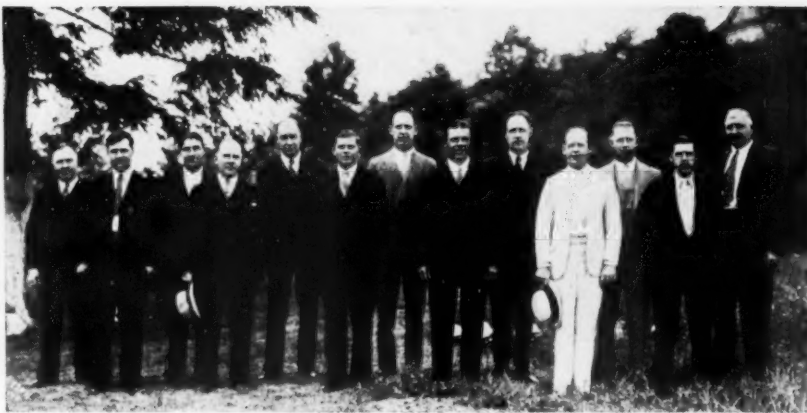
● **PACKED** in special export bags and destined for the far Pacific Islands made famous by the recent epoch-making flight of the "China Clipper," 18 tons of finest Pennsylvania anthracite were put aboard the Panama Pacific liner "Pennsylvania" on December 12. The fuel will be used to cook meals and heat water for the ground crews of the Pan American Airways, who man those lonesome stations along the route of the first trans-oceanic air service, as well as for the clipper crew and passengers between "hops." The equipment in each place includes a commercial type A. G. A. anthracite range. As this type has been tested and approved by the Anthracite Institute Laboratory, the Pan American Company asked the Institute to arrange the shipment of the best fuel for the purpose. Chestnut coal was recommended by the Laboratory and six tons of it are being sent to each island—Midway, Wake and Guam.

The coal has been packed in 360 special lined export bags, of 100 pounds capacity, and each bears the legend "Pennsylvania Anthracite for Midway Island," "Wake Island," or "Guam." Six tons will be a year's supply for each station. The supply ship will visit these places every six months but the first shipment will include enough fuel to provide for emergencies.

The "S. S. Pennsylvania" will take the coal to San Francisco by way of the Panama Canal where it is due to arrive January 4, and at that port it will be transferred to the airway company's supply ship.

● **THE** latest report in the series of Commerce Department consumer studies, covering a limited number of cities, is based on information obtained from Trenton, N. J., consumers, according to Wilford L. White, chief, Marketing Research and Service Division, Bureau of Foreign and Domestic Commerce, in announcing completion of the sixth study on the use of selected goods and services by families of designated incomes.

A total of 3,707 families provided important facts regarding the type of durable goods and related products used in their homes in 1934 and the income of each family during the preceding year. As the basis of material used in this study, interviewers called at approximately 14 percent of the dwellings on each street in the city and obtained information which included size of the family; income from all sources; rent



First Aid Instructors' Club

paid by tenants; home construction; type of heating equipment used; kind of fuel burned for heating, lighting, and cooking; and other data concerning use of family equipment.

Slightly more than 86 percent of all reporting families had incomes of less than \$2,000, Mr. White stated, and these families occupied more than three-fourths of all the brick homes; constituted 82 percent of the users of central heating equipment; 85 percent of all users of gas for cooking, more than one-half of the consumers of mechanical refrigerators and claimed about 72 percent of all automobiles in use by the entire family population covered by the study. "While the lower-income groups—due to the concentration of families within these groups—are thus shown to absorb so large a percentage of the total market," Mr. White said, "it is naturally true that the higher-income classes contain fewer families that fail to use these products."

Coal is the principal fuel used for house heating in this city and few families use other than gas for cooking. Electricity is used for lighting in about 95 percent of the homes. Less than 15 percent of all families having incomes of \$5,000 or more reported no automobile and almost one-fifth of the families within this income range reported ownership of two cars. Annual rent ranged from an average of \$208 in the lowest income class to an average of \$740 in the highest, and the average number of persons from 4.7 to 4. The summary of statistics show that without exception each income class has a smaller average number of persons per family, a larger average number of rooms occupied and a higher average rent than is reported by the group next lowest in income.

The Trenton study is one of a series of consumer-market studies made under the direction of Ada Lillian Bush, chief of the Consumer Market Section of the Marketing Research and Service Division.

● **THE** above picture is the photo of the first First Aid Instructors' Club of the United States of America from Marsteller, Pa.:

Reading from left to right, they are as follows: Mr. F. F. Mulvehill, Andrew Homidy, Charles Cowan, J. J. Jones, Henry Larsen, John Frank, Jr., Joseph R. Dukes, William Seeley, J. H. MacIndoe, Alexander Davidson, Richard Tobin, Jess Evison and Mr. J. G. Nicholson, superintendent of the Pennsylvania Coal & Coke Corporation, Colliery No. 21-22, Marsteller, Pa., at which mines the above named men attained their right to the first certificates of their kind issued to men who by reason of five successive years of instructing their fellow workmen in the art of first aid training to injured workmen.

After completing five successive years of training men in the art of first aid, and receiving from the U. S. Department of Mines, for this service, permanent first aid instructors certificates which entitles them to teach first aid work anywhere in the United States with the sanction of the U. S. Department of Mines, the above named men formed a club which they named the first First Aid Instructors' Club of America, and have their meetings regularly, and have pledged themselves to further the interest in first-aid training around industrial works, and to give any service which might be beneficial to anyone wanting to start this worthy practice at their plants.

With the splendid cooperation of the Pennsylvania Coal & Coke Corporation, through their general manager, Mr. A. L. Hunt, who at all times took a deep personal interest in the work, Mr. J. G. Nicholson, superintendent at the Moss Creek operation, who gave every consideration to the men in the training of the employees for the five-year period.

The above First Aid Club wishes to thank the Pennsylvania Coal & Coke Corporation, their management, and the U. S. Department of Mines, their officials, especially Mr. J. J. Forbes and M. J. Ankeny for the interest they showed in the completion of this work.

● THE seventh Congress of Mines, Metallurgy and Applied Geology, was held in Paris from October 20 to 26, with 1,500 representatives drawn from all over the world, attending. Among the 354 papers which were presented in the various sections, a few of particular interest include those by Prof. R. V. Wheeler on the constitution of coal; by A. Duparque on the petrographical study of coals, and by P. Chovin and L. Gion on the sampling of fire damp and carbon monoxide by semi-automatic means.—*Colliery Guardian*, November 8, 1935.

● SCRANTON TIMES of November 27, carried the following:

"Included among contributions to the Community Chest turned in at the final report meeting last night, was one of \$25,000 from the Glen Alden Coal Company. This was credited to Division C and included in its return. Had it been transferred to the mines' division, headed by George V. O'Hara, Glen Alden official, it would have brought that division's total to approximately \$102,000, or slightly more than the quota of \$100,984.20 given to this group."

● A FIVE-YEAR, country-wide campaign to reduce motor vehicle deaths at least 35 percent by the end of 1940, looking toward the saving of at least 38,000 lives, has just been announced by the National Safety Council. The drive will start January 1, to continue with growing intensity and momentum throughout the five-year period. It will be localized for each state and for practically each city where closest cooperation will be maintained with public officials, traffic safety leaders, safety groups, educational heads, civic organizations and interested individuals. It is planned to coordinate much of the existing safety effort, to centralize and standardize the work through applica-

tion of tested methods proved by successful experience. Close cooperation with Federal departments is assured. The campaign, largely educational, will include a broad program of engineering and enforcement activities.

● UNITED STATES Bureau of Mines Information Circular 6858, "Tabular Index of Bureau of Mines Information Circulars on Mining and Milling Methods and Costs," has been prepared for the benefit of those who have received and kept files of these circulars. The index may be obtained free of charge by applying to the Information Division, U. S. Bureau of Mines, 900 F Street, N. W., Washington, D. C.

● EUGENE McAULIFFE, president, Union Pacific Coal Company, excerpts from whose book "The Romance and Tragedy of Coal," we printed in our October issue, advises that this book was privately printed in 1931 and several hundred copies given away; that the stock is now exhausted, and that he is unable to meet the numerous requests which readers of this publication have addressed to him for copies of the book.

● OFFICERS and Executive Board, Illinois Mining Institute, 1935-1936, are: President, T. J. Thomas, president, Valier Coal Co., Chicago; vice president,

W. J. Jenkins, president, Illinois Coal Operators Association, St. Louis, Mo.; secretary-treasurer, B. E. Schonthal, Chicago.

For members of the Executive Board: W. C. Argust, general superintendent, Peabody Coal Co., Taylorville, Ill.; W. J. Austin, Hercules Powder Co., Chicago; Carl Elshoff, Mine B. Coal, Springfield, Ill.; Charles F. Hamilton, president, Pyramid Coal Co., Chicago; John E. Jones, Old Ben Coal Corporation, West Frankfort, Ill.; Dr. M. M. Leighton, chief, Geological Survey, Urbana, Ill.; James McSherry, director, Department of Mines and Minerals, Springfield, Ill.; Fred S. Phafier, president, Superior Coal Co., Chicago; C. J. Sandoe, vice president, West Virginia Coal Co., St. Louis; H. H. Taylor, Jr., vice president, Franklin County Coal Co., Chicago; Harry A. Treadwell, general superintendent, C. W. & F. Coal Co., Benton, Ill.; Paul Wier, vice president, Bell-Zoller Coal Co., Chicago.

● THE CALIFORNIA UNEMPLOYMENT INSURANCE ACT goes into effect on January 1, 1936, and is enforced by the Unemployment Reserves Commission. This act provides that for the year 1936, the employees shall pay into the unemployment reserves fund .45 of 1 percent of their wages, and that employers shall pay .9 of 1 percent of the payrolls. The maximum payments to



"Equal Justice for All"

JANUARY, 1936

this fund is reached in 1938, when employees will pay 1 percent of wages, and the employers 2.7 percent of payrolls. The act does not apply where total number of employees of an employer is less than eight.

Employers for whom 8 or more persons work for 20 days out of any tax year, even though the employment is spread out over different weeks, must contribute to the insurance fund. Workers out of jobs because of labor disputes or others who refuse suitable employment will not be entitled to unemployment insurance benefits, though they may have paid into

California News—continued

the fund for a considerable time. The tax on payrolls of employers in California including the Federal Social Security Act will reach 5.7 percent of the payrolls in 1938. This added to the cost of compensation insurance (base rate for year 1935 for underground men is \$11 per \$100 payroll), will be a great burden on mine operators.

● AT THE Cardinal Mine in Inyo County, 150 tons of ore per day are being treated, and Victor Bongard is now manager of this property having succeeded Wm. Val De Camp.

● THE NATOMAS COMPANY, one of the largest gold dredging operators in the state, report an excellent production for the first nine months of 1935. The profits were \$782,033 equivalent to 78½ cents per share, or an increase of 8½ cents a share over the corresponding period of 1934; profits for 1934 (first nine months) were 70 cents per share.

● AT THE MOUNT ETON MINES near Georgetown, new equipment has been installed consisting of Chilean mill, concentrators, compressors, etc.; so that with this installation active mining can be pursued.

● THE CLEAR CREEK DISTRICT near Havilah, Kern County, is receiving attention, and recently Seymour Hatch of Bakersfield has taken an option on the Golden Arrow claims.

● IT IS REPORTED that a relic of early day mining, namely a Cornish pump, from the North Star Mine of Grass Valley, has been given to Henry Ford's museum in Michigan.

● DEVELOPMENT WORK at the New York Mine, Fort Jones, Siskiyou County, is progressing under the direction of Superintendent C. C. Plumb, and some excellent ore has been disclosed, but the extent has not been determined.

● THE WALKER MINE in Plumas County, a copper property, has been reopened with a crew of some 400. While the principal metal is copper, gold and silver are obtained as by-products of the ore. H. A. Geisendorfer is manager. The longest aerial tramway in the state (8 miles) is used to convey concentrates, supplies etc., from the mine to the Western Pacific Railroad at Spring Garden.

● IN AMADOR COUNTY, the activities center around Jackson and Sutter Creek-Argonaut mine, E. A. Stent, manager and Alex Ross, superintendent, at the Kennedy where 1,000 ton cyanide plant in operation with Wm. Sinclair as superintendent, and at the Old Eureka Mine owned by Central Eureka Mining Company with James Spiers as superintendent. This company is also doing some development work in the Wildeman property for the owners.

It is interesting to note that the Argonaut and Kennedy mines are the two deepest gold mines in the United States—one mile in depth.

● EL DORADO COUNTY is the scene of much activity, and a number of the old properties have been reopened. The name El Dorado means "golden one"; it is the 5th county in the state in gold production. It was in this county that J. M. Studebaker manufactured wheelbarrows for the miners from 1853 to 1858 at Placerville. He then went to South Bend, Ind., and engaged in the manufacture of wagons, buggies and subsequently automobiles. The following properties are being worked actively, Grit, Lillias and Spanish mines at Greenwood, Church and Union, Beebe, Gold Reserve, Big Canyon (1,000 ton cyanide plant), Zantgraf mine to be reopened. In addition a number of prospects are being developed.

● THE IDAHO-MARYLAND MINES COMPANY of Grass Valley, Erol McBoyle manager, has acquired a number of properties under option at Forbestown, Butte County; among these are the Gold Bank, King Midas and Burlington, and development work is now being pursued at these holdings. This is a big thing for Forbestown as active work has not been done for several years.

● CONSIDERABLE development work is being done in Plumas County—at the Indian Valley mine—under control of John W. Prentiss of New York, diamond drilling is to be done, in addition to the usual development program.

● THE GOLDEN QUEEN MINING COMPANY, Mojave, Kern County, has completed a 300 ton mill (all slime cyanide plant); one unit of 50 tons will be used to treat custom ores, which is a big thing for other properties in the district adjacent to the holdings of this company. The officials of this company are H. S. Enlow, president, Peter Cox, secretary and Wm. C. Browning, manager; main office, 233 Broadway, New York City, and local office 1214 Pacific Mutual Bldg; Los Angeles.

● IN THE GRASS VALLEY-NEVADA CITY district the usual mining activity is in evidence with the completion of the building of the mill at the Spring Hill mine, H. R. Plate, manager, and production from the Empire Star Mines Co.; F. W. Nobs, manager, Idaho-Maryland and Brunswick, Republic, Edward Jacobs, manager, and the Golden Center with Cooley Butler as operator.

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Items concerning California mining were furnished by G. Chester Brown, Secretary, California Metal and Mineral Producers Association.

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● ESTIMATES of bituminous coal production in the United States for the week ending December 28 were approximately 6,870,000 net tons. The report of the Bureau of Mines shows production of 8,179,000 tons for the week ended December 14, and 8,385,000 for the week ended December 21, 1935. Production calendar year to December 28, 1935—364,310,000 tons; 1934, 357,973,000 tons.

● MINE SUPERINTENDENTS of northern ore mines of the Republic Steel Corporation interests in the Lake Superior region met on December 20 in Duluth with John E. Nelson, general manager, and J. Murray Riddell, assistant general manager.

● MEMBERS OF the Minnesota section, American Institute of Mining & Metallurgical Engineers, were the guests of the American Steel & Wire Company at its plant at Morgan Park, Duluth, on December 13. The visit included a trip through the various plant departments making and fabricating steel. Following a luncheon given by the steel plant at the Morgan Park Club House, Dr. Marcus A. Grossman of the Carnegie-Illinois Steel Corporation gave a talk on alloy steel. At the business meeting, the following officers were elected for 1936 for the Minnesota Section: chairman: E. H. Comstock, dean of the School of Mines, University of Minnesota; vice chairman, Wilbur Van Evera, mining engineer, Crosby; vice chairman, W. L. Taylor, mining engineer, Hibbing; secretary-treasurer (re-elected), S. E. Atkins, engineer and diamond drill contractor, Duluth.

● THE LAKE SUPERIOR IRON ORE ASSOCIATION reports that consumption of iron ore by furnaces that rely upon the mines of the Lake Superior district totalled 3,020,315 gross tons in November, 1935, as compared with 1,298,404 in November, 1934. This was an increase of 109,452 tons over the preceding month of October. One hundred and three blast furnaces were active at the end of November. Iron ore stocks on Lake Erie docks and in furnace yards totalled 34,276,968 tons as of December 1, 1935, as compared with 34,840,861 as of December 1, 1934.

● THE OLIVER IRON MINING COMPANY is operating 10 underground iron mines in the Lake Superior district. These are the Holmes-Section 16 on the Marquette range, Mich.; the Davis-Genève and Puritan on the Geogebic range, Mich.; the Pioneer, Sibley and Soudan on the Vermilion range, Minn.; and the Leonidas, Spruce, Morris and Godfrey on the Mesabi range, Minn.

● MINERS in the Picher District received a Christmas vacation ranging from one day to an entire week. Many properties closed down during the Christmas holidays.

● **ONE OF THE** largest tailing mills in the Tri-State Lead and Zinc field was put into operation the middle of December. This plant is the new electrically driven plant of the Youngman and Youse Mining Company, with approximately three years work ahead, the mill, which will handle 60 tons an hour, will employ 30 men. Approximately one million tons of tailings from the Vinegar Hill Zinc Company and the Westside Lease will be treated. The plant contains two center feed six-celled rougher jigs, a five-cell sand jig, six tables, four float machines, one filter, one sixty-foot thickener, two sets of 30-inch rolls, and one set of 42-inch rolls.

● **THE UNITED VERDE** Extension Mining Company distributed about \$50,000 among its 500 employees as a Christmas present. Every one, from mucker to executive, who had been on the pay roll any length of time received \$100, while those who were classed as "new" employees received \$25 apiece.

● **THE BUREAU OF LABOR** Statistics has recently released some interesting data based upon a survey that shows that 76.5% of industrial establishments deal with their employes on an individual basis. Trade unions represent the workers in 19.5% of the plants, company unions or employee-representation plans in 3.4% and a combination of the two is used in six-tenths per cent. The bureau found that 19.9% of the workers in establishments covered by the study worked in plants with company unions, 30.2% were represented by trade unions, 7.4% by both and 42.5% had individual dealings with their employers.

A notable expansion in number of company unions has taken place since 1933, the bureau reported.

● **THE NATIONAL BITUMINOUS COAL COMMISSION** issued an order declaring against the immediate establishment of minimum prices for Price Area No. 1 and subsequently provided for the establishment of such minimum prices. The first order followed upon the hearing held the last days of December. Following the hearing the Commission ruled "against the propriety of immediately establishing minimum prices under the provisions of General Order No. 10, for the reason that the determination of such minimum prices is now progressing effectively pursuant to a series of special orders numbered 6-a to 6-w, inclusive, applicable respectively to Districts numbered 1 to 23, and the Commission being fully advised in the premises, now therefore, for good cause shown, it is hereby ordered without prejudice that minimum prices be not established in Price Area No. 1 pursuant to General Order No. 10 or in the manner in said order contemplated; it is hereby further ordered that all District Boards shall promptly proceed with the classification of coals; the determination of proposed minimum prices; the drafting of proposed marketing rules and regulations; the coordination of such proposed prices and regulations; and submission thereof to the Commission, all in conformity with Section 4 of the Bituminous Coal Conservation Act and further orders of the Commission made pursuant thereto."

The Commission then followed this action with subsequent orders, Nos. 12, 12-a, and 13-a, respectively, requiring all District Boards to classify coals and

adopt standards of coal classification, methods of applying such standards, rules of procedure for making classifications; requiring all District Boards within Price Area No. 1, to establish rules incidental to the sale and distribution of coal by code members; and requiring boards within Price Area No. 1 to establish proposed minimum prices for approval, disapproval, or modification by the Commission.

The last order, dated January 2, proposes that the price of \$2 a ton be used as the weighted average of the total cost for Price Area No. 1. A limited number of copies of all orders are available through this office.

Touching upon the bar existing against purchase by the Government or its contractors of non-code produced bituminous coal, Comptroller General McCarl ruled that the Government cannot require contractors furnishing "provisions" to use nothing but the code produced coal. The Comptroller made the distinction that while the Act requires the use of coal produced in accordance with the Act for "any public work or service" this term cannot be construed to include contracts for the furnishing of supplies or other materials. The ruling came in a case where the Government rejected a bid from a dairy company which had struck out the clause requiring code produced coal be used.—(*From A. M. C. Bulletin Service.*)

● **A 250-TON MILL** fully equipped began operating at the old Riverside Mine in the Joplin District on December 21. Twenty men are employed at the present time and it is anticipated that production will go forward rapidly. The old Riverside Mine was formerly a heavy





R. E. SALVATI

13TH ANNUAL COAL MINING CONVENTION AND EXPOSITION

The American Mining Congress

The 1936 annual meeting for the coal industry, sponsored by the Coal Division of The American Mining Congress, will be held at Cincinnati, Ohio, May 11 to 15, inclusive. The Program Committee for this meeting is headed by R. E. Salvati, general manager of the Island Creek Coal Company, as national chairman. The committee, consisting of representative mining men from the various coal producing districts of the United States, is holding sectional meetings in Chicago, Charleston, W. Va., and Pittsburgh, Pa., during the current month.

The exposition of mining machinery and equipment, held in conjunction with this meeting under the sponsorship of the Manufacturers Section of The American Mining Congress, gives every indication of being at least one-third larger than the 1935 exhibit which set an outstanding record for both magnitude and attendance.

Details on both the convention and exposition will appear in the February issue of the Mining Congress Journal.

producer and has just recently been rehabilitated.

● **THE EAGLE PICHER** Mining and Smelting Company brought its zinc shipments for the year 1935 to above 70,000 tons, a mark that has been attained by only two other companies in the history of the Tri-State District.

● **ACCORDING TO** information from the Tri-State Lead and Zinc District, the Webb City mining field is coming back. Considerable tonnage is being sent daily to Central Mill. Press reports say that one of the features of the new field is the opportunity for miners to become gougers. Representatives of the Webb City Lead and Zinc Company say that the lessees are willing to release properties so that a great number may work in old diggings profitably. Until these recent developments in this field, mining has not been carried on at Webb City since 1917.

● **THE LATEST DECISION** against the Guffey Act was handed down in Kansas City, Mo., December 31, where Federal Judge Albert L. Reeves granted an injunction against the Act sought by six western Missouri coal mining companies.

Judge Reeves ruled that Congress' attempt to control the bituminous coal industry through the Guffey Act was unconstitutional. Judge Reeves ruled that the general welfare clause of the Constitution did not give Congress any specially assigned power to make provision for the general welfare. Five temporary injunctions restraining collection of the penalty tax have already been granted in the Pennsylvania area and a sixth is sought in a suit filed December 31, by the Loyal Hanna Coal & Coke Company. The Coal Commission, in a press release commenting on the ruling granted the Pittsburgh Terminal Coal Corporation allowing an injunction, declared that the decision did not affect the constitutionality of the Act.

● **WITH THE** domestic stock of copper the lowest it has been in five years and the fabricating business the best it has been during that time the copper and brass industry is looking forward to 1936 as the beginning of a natural return to normalcy. At the close of 1935 the stock of copper above ground in the United States had been whittled down to just a little more than 200,000 tons. Production of the fabricating plants during the year showed steady increase,

with the last quarter the best in many years.

Protected by a 4-cent tariff, domestic copper is selling at more than 9 cents a pound, with the result that all producing companies are making money. Output of mines has been increased and during the last six weeks a number of mines that had been closed down, have resumed operations. This was necessary to keep pace with increased production of fabricated materials. The result has been that employment in the mining centers has shown marked improvement and should continue through the New Year.

The members of the Copper & Brass Research Association which today consists of the leading fabricators of copper and copper alloys, increased production of their plants gradually throughout 1935, with the result that there was a general decrease in unemployment at Waterbury, Detroit, and other fabricating centers. As a matter of fact, during the last four months, many of the departments operated three eight-hour shifts in an effort to meet demand.

It is, therefore, natural that in view of marked improvement in both the mining and fabricating wings of the industry during 1935 the executives of those companies are looking to 1936 greatly

encouraged for continued improvement in business. These captains of industry predict that unless something unforeseen develops 1937 will be an even more prosperous year than 1936.

Under the protecting wing of that now extinct bird, the Blue Eagle, the copper and brass industry was able to operate on somewhat stable markets. Then came the Supreme Court decision which for a time had a most upsetting effect on all industry. But industry was soon able to right itself. Fear that had gripped most of the nation was shaken off and hoarding ceased. This resulted in a general buying movement which had the effect of increasing production of all commodities.

The automobile industry was one of the first of America's basic industries to show rapidly mounting production, with the result that during 1935 more than 4,000,000 automobiles were sold. This is one of the large copper and brass consuming industries. It is estimated that perhaps some 200,000,000 pounds were consumed in 1935 and that tonnage will likely be increased during 1936.

The building industry, as was expected, has been slow to settle in its stride. However, under the stimulus of Federal Housing Administration, which the Roosevelt regime is exerting every effort to make a success building gradually started climbing upward, until during the last quarter of 1935 there was

more money spent for rehabilitation and new construction than any three months since the depression was first felt some years ago. The building industry is another large consumer of copper and its alloys. It is estimated that more than 150,000,000 pounds were consumed during 1935 and that tonnage may easily reach 200,000,000 in 1936, particularly in view of the fact that many experts believe that within the next three or four years more than a million new housing units will be constructed. The uses of copper and its alloys in the building industry are manifold. It includes roofing materials, pipe and tubing for water lines, electric wiring, hardware, lighting fixtures, insulation, weather-proofing, hot water heaters, termite protection, etc.

Approximately 50,000,000 pounds of copper and its alloys was used this year in the manufacture of mechanical refrigerators. This is a comparatively new industry but it has become a major consumer of copper.

Air conditioning is the baby giant of the new industries. The consumption of copper in that industry during 1935 was probably only a little over 3,000,000 pounds but it would not be surprising to see that industry soon become as large a consumer of copper as is the mechanical refrigeration industry. Railroad trains, hotels, apartment houses, clubs, restaurants, steamships and homes are

being air conditioned, while during the year 1936 it is expected that all new office buildings as well as many of the old ones will also be air conditioned.

During the Christmas holidays the manufacturers of giftware articles made of copper and brass, oftentimes plated with chromium, operated three eight-hour shifts in an effort to meet the demand for repeat orders coming from department stores and gift shops throughout the country.

Concealed copper radiators are coming into general use in all types of buildings, on steamships and naval vessels. Manufacturers anticipate one of their peak years in 1936.

Public utilities have not during the past few years spent much money for either extension, improvement or repair to their lines. If the utilities were to step into the market tomorrow and buy all the copper necessary to meet their requirements, it would result in wiping out entirely the little more than 200,000 tons now above ground.—(B. B. Caddle, Secretary, Copper & Brass Research Assn.)

● ELEVEN AND ONE-HALF MONTHS actual mine production with an estimate by the mine operators and smelters for one-half of December indicates that the output of gold, silver, copper, lead, and zinc, from Colorado ores and gravels in 1935, in terms of recov-



ered and estimated recoverable metals was 351,347 ounces of gold, 4,605,845 ounces of silver, 14,339,000 pounds of copper, 10,738,000 pounds of lead, and 2,027,000 pounds of zinc, according to Chas. W. Henderson and A. J. Martin, of the Denver office of the U. S. Bureau of Mines. These figures are to be compared with 324,923 ounces of gold, 3,475,661 ounces of silver, 11,294,000 pounds of copper, 8,435,000 pounds of lead, and 1,544,000 pounds of zinc in 1934. Compared with 1934, all five metals show increases as follows: Gold 26,424 ounces, silver 1,130,184 ounces, copper 3,045,000 pounds, lead 2,303,000 pounds, and zinc 483,000 pounds. The gross estimated value of the output of these metals in Colorado in 1935 is: Gold, \$12,297,145; silver, \$3,399,114; copper, \$1,204,476; lead, \$429,520; and zinc, \$93,242. From 1858 to 1935, inclusive, Colorado has produced, in terms of recovered metals, 36,081,624 ounces of gold, 672,255,887 ounces of silver, 356,103,430 pounds of copper, 4,635,615,583 pounds of lead, and 2,236,483,985 pounds of zinc, with a total value for the five metals of \$1,709,082,690 (gold produced before 1933 calculated at \$20.67 plus per fine ounce; 1933 at \$25.56 per fine ounce; 1934 at \$34.95 per fine ounce, and 1935 at \$35 per fine ounce). There were between 900 and 950 producing lode mines in the state during 1935, compared with a precise count of 929 in 1934, the totals for both years including many mines and prospects from which lots of ore ranging from less than ½ ton to 25 tons were shipped. The 1935 count includes many properties at which only surface operations were undertaken in 1934. Ore reduction mills of 20 or more tons daily capacity (average about 100 tons), of which 14 also treated some custom ore, operated all or part of 1935 in connection with 92 of the mines, indicating an increase of about 35 percent over 1934 in number of active mills. In addition six mills and one smelter treated custom ores exclusively in 1935, the same number as in 1934.

● **MEMORANDUM NO. 4**, from National Bituminous Coal Commission: "The Commission has been informed by persons conversant with tax laws and regulations that institution of suits for injunction of the character now being sought by some producers are commenced earlier than necessary when commenced prior to receipt of notice of assessment from a collector of internal revenue. It is suggested that all producers of bituminous coal consult their attorneys with respect to this question. Dated December 29, 1935."

● **THE PUBLICATION** of the "Minerals Yearbook, 1935," is announced by the Bureau of Mines, Department of the Interior. The volume, containing 75 chapters, 129 illustrations, and nearly 1,300 pages, constitutes a condensed library of current developments in the mineral industries. It chronicles the production of a hundred commercial minerals in the United States and abroad

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So-called "must" legislation that made the last session a long and arduous one is definitely limited in extent for this session, except for possible eventualities.

Definitely on the agenda for consideration and probable enactment are at least these measures—neutrality, ship subsidy, and a bonus payment bill. The latter is not classed as an Administration sponsored affair but the indications are that party leaders have told the President that some sort of a bonus measure must be passed. The European and general international situation together with the Feb. 29 expiration date of the present neutrality resolution makes this issue of paramount importance. There are good reasons to believe that while the Congress may balk at extending to the President the discretionary power that the Administration is said to want in neutrality measures, it will yield to the pressure of including "all commodities of war" within the embargo list barred to bel-ligerents. This would include steel, copper, oil, cotton, and hundreds of other commodities. Ship subsidy legislation is ardently desired by the Administration and during the recess steps have been taken to secure the cooperation of previously conflicting forces on this question. Removal of the present subsidy paid through the Post Office department for mail carriage is part of the program. This is the chief source of revenue to the American merchant marine so far as the Government is concerned. Instead a subsidy to make up the difference of both building cost and operation cost as between American vessels and foreign bottoms, is part of the new legislation; also construction loans from the RFC, limitation of shipments and mail carriage as far as possible to American ships, and barring more than a specified percentage of foreign citizen crew personnel in American ships are among the other features.—(As reported by the Weekly Bulletin, Jan. 4, The American Mining Congress.)

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during the year 1934. Technical progress in the production of these minerals and their present economic position are reviewed.

The "Minerals Yearbook, 1935," continues the advances made in its immediate predecessor and incorporates many improvements based on constructive suggestions volunteered by close observers and students of the mineral industry. In addition to accurate official data on all commercially important minerals, there is a resume of the principal economic developments in mining, as well as chapters dealing with progress in coal utilization, uses of petroleum fuels, petroleum and natural gas production, mine safety, and mineral developments from a world viewpoint. Chapters on miscellaneous commercial gases and on minor nonmetallic minerals appear for the first time. Recommendations of the National Resources Board and activity under the National Recovery Administration are reviewed in the commodity discussions. An analysis of the extent of business recovery for various mineral groups is given. Important occurrences in gold and silver mining and markets are thoroughly surveyed, supplemented by detailed reviews of activity in the metal mining districts of the various states. Fifty-nine specialists have contributed to the volume.

The mineral production of the United States in 1934 was valued at \$3,350,000,000, an increase of 31 percent from \$2,555,100,000 in 1933, it is stated in a review of the mineral industry contained in the Yearbook. This advance in total value reflected not only increased output

but also higher unit prices, which resulted in part from provisions of codes of fair competition under which virtually all branches of the mineral industry operated to some extent during 1934. Production of virtually all major mineral commodities increased in 1934; outstanding examples were coal, gold, silver, natural gas, cement, and crushed stone. Prices likewise increased, especially for silver, gold, pig iron, copper, petroleum, bituminous coal, and cement.

"Vanishing markets, disappearing profits, excess capacity, huge accumulations of some of the metals, unemployment, and frozen investments call for intensive work in mineral commodities," states Director John W. Finch, in a foreword to the Yearbook. "In the investigation of many mineral products, particularly the nonferrous metals, studies must have international scope. Under confidential relations that have been established mineral producers give freely to the Bureau all necessary figures, and these data are merged in general results very useful in economic analyses. Clearly, in view of the urgency of such analyses, all the fundamental work upon which they are based should be strengthened and developed so as to give the economist and the mineral producer a comprehensive picture of mineral resources, output, consumption, distribution, and trade conditions, as well as of regional and international factors affecting the movement and utilization of mineral commodities."

The series of "Minerals Yearbooks," presents the current annual record of the various mineral industries against a

background adequate for perspective in the interpretation of current trends. The Yearbooks are supplemented by periodic or preliminary reports that release current statistics with maximum speed and by special economic studies that deal exhaustively with relatively limited fields or subjects.

In announcing the "Minerals Yearbook, 1935," the Bureau of Mines wishes to point out to the mineral industry that the supply of copies available for distribution is limited. Ever since the first "Minerals Yearbook" was announced in August, 1933, as an innovation among Government statistical reports combining complete data on minerals with promptness of publication, the immediate demand for each edition has far exceeded the supply despite large increases in the number of copies available. About 2,500 copies of the 1934 volume were sold before they could be delivered by the printer, and a total supply of 7,600 copies was soon exhausted.

● **CHARGING** that the union has refused to permit the members to install electrical equipment fabricated by its members, the National Electrical Manufacturers Association has filed a complaint in a United States District Court against Local Union No. 3 of the International Brotherhood of Electrical Workers and six of its principal officers. The complaint charges conspiracy to ruin the business of the National Electrical Manufacturers Association and its members in the New York metropolitan district, and demands damages. The action was brought under the Sherman Anti-Trust Law.

● **THE MINE INSPECTORS' INSTITUTE OF AMERICA** will hold its 1936 meeting in Denver, Colo. The dates are June 29-30, July 1, and headquarters will be in the Shirley-Savoy Hotel, Denver.

● **ACCORDING** to the Civil Service Commission, a new high of 796,297 Federal pay rollers was reached during October, 1935. The number of persons drawing salaries from the Government increased by 1,830 during that month, due to the new emergency agencies set up under the present administration. Regular Government bureaus which were in existence prior to the New Deal showed a net decrease in employes during October of 17,184; most of this decrease was due to a shift of 15,000 War Department workers to an emergency basis. There were still 605,618 bureaucrats on the pay roll of the regular departments at the end of the month.

● **SHIPMENTS** of anthracite for the month of November, 1935, as reported to the Anthracite Institute, amounted to 2,868,490 net tons. This is a decrease, as compared with shipments during the preceding month of October, of 812,762 net tons, or 22.08 percent, and when compared with November, 1934, shows a decrease of 732,162 net tons, or 20.33 percent.



W. J. Jenkins
Re-elected Chairman Executive
Board, Illinois Coal Operators
Association

● **THE COAL MINING INSTITUTE OF AMERICA** held its forty-ninth annual meeting at Pittsburgh, Pa., December 12 and 13, 1935. Many interesting papers were presented, including "Ventilation Characteristics of Mines and Fans," by A. L. Lee; "Mining Methods," by Newell G. Alford; "Transportation," by Prof. W. R. Chedsey, of Pennsylvania State College; "Ventilation," by George J. Steinheiser, state mine inspector, Indiana, Pa.; "Explosives," by S. P. Howell, of the U. S. Bureau of Mines; "Inspection," by Richard Maize, state mine inspector, Uniontown, Pa.; "Safety," by C. F. Keck, of Jamison Coal & Coke Company; "Personal Recollections," by Dr. J. J. Rutledge, of the Maryland Bureau of Mines; "Value of Good Underground Lighting," by Graham Bright, of Mine Safety Appliances Co.; "Requisites for Mechanical Loading," by George E. Bayles, Ohio and Pennsylvania Coal Co.; "Safe Supervision and Supervision Relative to Roof Control," by J. V. McKenna, state mine inspector, Waynesburg, Pa.; and "New Aspects of Detecting Gas with Flame Safety Lamps," by L. C. Illsley, of the U. S. Bureau of Mines. The "Question Box" session on Friday morning, December 13, under the chairmanship of M. L. Coulter, of Clearfield Bituminous Coal Corp., discussed "Are Accidents in Mines Being Reduced?"; Friday afternoon's discussion, under the chairmanship of M. D. Cooper, of the Hillman Coal & Coke Co., was "How Can the Mining Industry Aid in Reducing Stream Pollution?" The annual dinner was held on Thursday evening, December 12, with G. W. Riggs, president of the Institute, presiding as chairman, the principal address being made by H. N. Eavenson on "Coal—Business—Politics."

● **AT** a recent meeting the following were elected as officers of the Harlan Mining Institute for the year 1936: F. W. Stoutt, superintendent, Cornett-Lewis

Coal Company, Louellen, Ky., president; J. Q. Angel, general mine foreman, Mahan-Ellison Coal Corporation, Liggett, Ky., first vice president; Roscoe Petrey, general mine foreman, Clover Fork Coal Company, Kitts, Ky., second vice president; C. P. Collier, mining engineer, Harlan Fuel Company, Yancey, Ky., third vice president; J. F. Bryson, director of safety, Harlan County Coal Operators Association, Harlan, Ky., secretary. *Executive Committee:* Joseph Norman, safety engineer, Blue Diamond Coal Company, Chevrolet, Ky.; W. L. Provins, superintendent, Mary Helen Coal Corporation, Coalgood, Ky.; James Lee, safety engineer, Black Mountain Corporation, Kenvir, Ky.; W. D. Cohelia, superintendent, Dixie Darby Coal Company, Evarts, Ky.; Riley Clarkson, mine foreman, Harlan Collieries Company, Brookside, Ky.; Jack Mobiltini, mine foreman, Perkins Harlan Coal Company, Liggett, Ky.; Steve Arnott, superintendent, Kentucky King Coal Company, Wallins Creek, Ky.

● **THE AMERICAN INSTITUTE of Mining and Metallurgical Engineers** will hold its 145th annual meeting February 17-21, 1936, in the Engineering Societies Building, 29 W. 39th Street, New York, N. Y. An interesting group of papers is being scheduled for presentation. The annual dinner will be held February 19 at the Commodore Hotel, at which the 1935 awards will be made, and at which President Henry A. Buehler will preside as toastmaster.

Personal Notes

J. D. A. Morrow, president, Pittsburgh Coal Company, in a recent statement in the *New York Sun*, predicts that "the year 1936 will mark the greatest expansion of mechanical production and preparation of coal seen to date in these (eastern) districts that produce the chief tonnage of the nation."

John R. Hicks has withdrawn from the firm of Eavenson, Alford & Hicks, and we want to correct any impression that was created by the original announcement that he had retired from business.

Harvey S. Mudd, engineer of mines, Los Angeles, Calif., after December 25, should be addressed care Cyprus Mines Corporation, Skouriotissa, Nicosia, Cyprus (Island).

William Val DeCamp, formerly vice president and general manager of the Cardinal Gold Mining Company, Bishop, Calif., is now engaged in consulting work. His permanent address is 701 North Camden Drive, Beverly Hills, Calif.

Victor Bongard has been named vice president and general manager of the Cardinal Gold Mining Company, Bishop, Calif.

George Martinson, Pickands Mather & Company, Duluth, will take up his new duties with the safety department at the Cleveland offices of his company following a period of convalescence from an illness which recently confined him to the hospital in Duluth for several weeks.

Clarence W. Watson, formerly U. S. Senator from West Virginia, was appointed temporary trustee of the Elk Horn Coal Corporation on October 30 by Judge Nevin of the U. S. District Court at Cincinnati, Ohio. The appointment was made as the result of an application by the company filed in an answer to involuntary proceedings under the corporate reorganization amendment to the bankruptcy act. Seventy-five per cent of the company's bond and note holders are reported to be in favor of the reorganization.

Eugene McAuliffe, pres., Union Pacific Coal Company, was nominated for chairman of the Coal Division of the American Institute of Mining & Metallurgical Engineers for the 1936-37 term at the annual fall meeting of the division at St. Louis, Mo., on October 28.

Dr. Foster J. Curtis has been elected president of the MacLean Coal Company, Salt Lake City, Utah, succeeding the late Charles F. Worley, who died October 18, 1935. **Lawrence C. McFarlane**, formerly secretary of the company, has been named general manager.

Ralph H. Knode, president, Stonega Coke & Coal Co., has been elected a member of the board of directors, Appalachian Coals, Inc., to succeed **Ralph E. Taggart**.

R. S. Marshall, formerly vice president and general manager of the Sloss Sheffield Steel & Iron Co., has been elected secretary-treasurer, Woodward Iron Co., Woodward, Ala., following the resignation of **Herbert Smith**.

Alan Probert, formerly of Midvale, Utah, is now with U. S. Smelting Exploration, S. A., in Pachuca, Hgo., Mexico.

Frank V. Hicks, Union Pacific Coal Company, has been transferred to Winton, Wyo.

W. R. Lindsay, formerly manager of the Reno Gold Mines, Ltd., is now manager of the Hedley Mascot Gold Mines, Ltd., Hedley, B. C.

Ernest N. Patty has resigned as dean of the college and head of the School of Mines, Alaska Agricultural College, to become vice president and general manager of Gold Placers, Inc., an organization devoted to the development of gold properties in Alaska.

Stanly A. Easton, pres., Bunker Hill & Sullivan Mining & Concentrating Co.,

has been elected president of the Idaho Mining Association.

Benjamin F. Fairless, president, Carnegie-Illinois Steel Corp., has been elected to the Board of Directors, American Iron and Steel Institute, succeeding **W. J. Filbert** who has resigned. Mr. Filbert has been appointed an honorary vice president of the Institute.

N. H. Orr, formerly with the American Iron and Steel Institute, has been appointed general manager of sales, Colorado Fuel & Iron Co., Denver, Colo.

W. G. Polk, pres., Tennessee Jellico Coal Co., was elected president, Southern Appalachian Coal Operators' Association, at its November meeting. **J. B. Gatliff**, pres., Gatliff Coal Co., was named first vice president, and **H. K. Cook**, Diamond Coal Mining Co., second vice president.



Val DeCamp

J. W. Porter was elected president, Alabama By-Products Corporation, Birmingham, Ala., succeeding **Horace Hammond**, deceased. **Erskine Ramsay** was re-elected chairman of the board.

Frank S. Scott, has been engaged by the New River Coal Co., Charleston, W. Va., to direct its fuel engineering service. Mr. Scott was formerly on the fuel engineering staff of Appalachian Coals, Inc.

J. B. Warriner, president, Lehigh Navigation Coal Co., has been elected a director of the Consolidation Coal Company, under its recent reorganization.

George R. Wood, vice president, Cox Brothers & Co., and former superintendent of the Lehigh Valley Coal Company, died November 11 after an illness of several weeks. Mr. Wood was 47 years of age.

Dr. Otto Sussman, chairman of the board, American Metal Company, has been elected a director of the Consolidated Copper Mines Corporation.

The board of directors of the A. I. M. M. E. announced on November 15 that **Clinton H. Crane**, president, St. Joseph Lead Company, was chosen to receive the **W. L. Saunders** gold medal for 1935, the citation being "For distinguished achievement in the successful development and operation of low-grade lead mines." Mr. Crane was also recently elected vice president of the North American Yacht Racing Union.

The A. I. M. M. E. have also announced that **C. C. Henning**, assistant general metallurgist, Jones & Laughlin Steel Corporation, will receive the **Robert W. Hunt** medal and prize for 1936.

Dr. H. Foster Bain was tendered a farewell dinner by the mining engineers and geologists in Washington, on November 2, prior to his departure for Japan. The toastmaster of the dinner was **W. C. Mendenhall**, director of the United States Geological Survey.

R. B. Earling is now general manager of the Fairbanks Exploration Co., Fairbanks, Alaska, succeeding **O. J. Egleston** who was recently named vice president of western operations of the U. S. Smelting, Refining & Mining Company, Salt Lake City, Utah.

M. C. Lake, consulting geologist, Duluth, Minn., has returned from an extended professional trip in the West and Southwest.

Effective January 1, **W. J. Filbert** retired as chairman of the Finance Committee, United States Steel Corporation. He was succeeded by **Edward R. Stettinius, Jr.**

D. A. Callahan, president, Callahan Zinc-Lead Company, in speaking before the Idaho Mining Association, stated that the present trend of taxation is steadily toward indirect taxes, and taxes on special groups of people and properties.

Among prominent visitors to the Washington headquarters of The American Mining Congress during December were **Judge A. Scott Thompson**, Miami, Okla.; **D. A. Callahan**, president, Callahan Zinc-Lead Company; **Howard I. Young**, president, American Zinc, Lead & Smelting Company; **M. D. Harbaugh**, secretary, Tri-State Zinc & Lead Ore Producers Association; **Herbert Wilson Smith**, Union Carbide Corporation; **Dr. E. H. Wells**, president, New Mexico School of Mines; and **E. A. Williford**, National Carbon Company.

● **THE ANNUAL MINING INSTITUTE**, given under the auspices of the College of Mines, University of Washington, Seattle, for the past eight years, will again be held during the week of January 20 to 25, 1936. Meetings are scheduled at mines' laboratory on the university campus each day except Saturday, when a field trip is taken to some point of mining or metallurgical interest. Lectures and laboratory demonstrations are given by members of the staff and faculty of the College of Mines dealing with mining, metallurgy, ceramics, and related fields. Operators and engineers present subjects dealing directly with industry; representatives of leading manufacturers display and demonstrate new equipment and machinery. A special feature of the program will be a joint meeting with the North Pacific Section, A. I. M. M. E., which brings together the professional men and all others who are interested in the mineral industry. Requests for information should be addressed to **Milnor Roberts**, dean, College of Mines, Seattle, Wash.

● **EDWARD R. STETTINIUS, Jr.**, vice chairman of the Finance Committee of the United States Steel Corporation, became chairman of the committee on January 1, succeeding William J. Filbert, who retired under the Steel Corporation's pension plan. Percival Roberts, Jr., a member of the original board of directors, and since 1911 a member of the Finance Committee, has tendered his resignation from both bodies. Mr. Stettinius will succeed Mr. Roberts as a director and a member of the Finance Committee.

● **THE COPPER AND BRASS INDUSTRY** believes that the volume of business in the building field during 1936 will more than double that of 1935, with the result that perhaps some 200,000,000 pounds of copper will be consumed. Copper is used for roofing materials, weatherproofing and insulation; copper and brass pipe and copper tubing for

water lines; brass and bronze hardware and lighting fixtures and bronze screen cloth.

● **THE** following reported by the Anthracite Institute is a copy of a letter addressed by the Baltimore-Maryland Coal Exchange, Inc., to the Governor of Maryland on the trucking situation as it affects dealers in that state:

To His Excellency the Governor of Maryland:

The sale of stolen anthracite trucked from the state of Pennsylvania is rapidly undermining an industry in our state which employs thousands of men and pays to the state hundreds of thousands of dollars in taxes annually.

We petition you to communicate with His Excellency, the Governor of Pennsylvania, and support the following resolution in an attempt to protect the best interests of our state.

"Resolution adopted at a mass meeting of the Baltimore-Maryland Coal Exchange, Inc., Association of Commerce, Independent Grocers Association, Women's Civic League, Business and Professional Women's Club and Quota Club, it was unanimously resolved that you be petitioned to take effective and immediate action to put a stop to the promiscuous stealing of anthracite.

"Many million dollars worth of anthracite is being stolen in Pennsylvania and trucked to market to be sold at ridiculously low prices in destructive competition with legal anthracite.

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Recommended appropriations for activities of the National Bituminous Coal Commission and National Coal Labor Board for the fiscal year 1937 are carried in the President's Budget message. Appropriations for these activities are as follows:

	Estimated Appropriations 1937	Estimated Expenditures 1937
National Bituminous Coal Commission—		
Salaries and Expenses.....	\$900,000	\$875,000
Office of Consumers Counsel..	90,000	90,000
Total	\$990,000	\$965,000
Bituminous Coal Labor Board—		
Salaries and Expenses.....	\$160,000	\$150,000
Printing and Binding.....	5,000	5,000
Total	\$165,000	\$155,000

Contained in estimates of receipts for the fiscal year 1936 is an item of \$12,300,000 from collection of taxes imposed under the Bituminous Coal Conservation Act of 1935. No specific estimate for receipts for fiscal year 1936 is made.

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"To our knowledge nowhere in the civilized world does such a lawless condition exist where thieves are permitted to help themselves to a natural resource or other property.

"While legitimate mines pay heavy taxes, high wages, comply with stringent safety regulations, these thieves go unmolested.

"Maryland authorities we believe would soon end such flaunting of laws. We beseech you to take immediate action. We have implicit confidence in your desire to protect and safeguard the property rights of legitimate producers and retailers as well as miners."

BALTIMORE-MARYLAND COAL EXCHANGE, INC.

(Signed) **B. F. LUCAS**,

President.

(Signed) **JOHN F. PALMER**,

Executive Secretary.

Following is a detailed summary of zinc production by sources for the past three years.
SLAB ZINC PRODUCTION, 1933, 1934, 1935

	1933	Tons of 2,000 lbs. 1934	1935
(a) Primary Zinc from domestic ore—			
By Distillation	217,695	278,709	293,869
By Electrolytic	88,315	76,657	118,476
	306,010	355,366	412,345
(b) Secondary Zinc from ordinary type smelters.....	18,695	11,567	18,740
Total—American Zinc Institute Monthly Statistics.....	324,705	366,933	431,085
<i>Additional Production Not Included in Regular Monthly Figures:</i>			
(c) Secondary Zinc from large graphite retorts.....	11,392	8,124	8,701
Total Domestic	336,097	375,057	439,786
(d) Primary Zinc from foreign ore (per U. S. Bureau of Mines)	1,172	8,224	Not yet available
Total—All Classes	337,269	383,281	Not yet available

(From American Zinc Institute.)

Died

Wm. T. Todd, mine superintendent, The Wolf Tongue Mining Company, who had been with the company 32 years and was well known throughout the country as authority on tungsten mining and mining in general, passed away December 31, at Boulder.

Robert N. Bell, Boise, Idaho, died December 1, 1935, age 71 years. Mr. Bell was a distinguished mining engineer of Idaho, for 16 years was mine inspector of Idaho, and was a high authority on the mineral resources of the famous Gem State.

Wheels of Government

(Continued from page 36)

ficer, one Naval officer. Authorizes board to make studies regarding any metals, ores, compounds, or materials which might be appropriately classified as strategic materials, and when it deems domestic supply to be insufficient to meet the industrial and military needs of the country, to recommend that any such material be designated as a strategic material; President then authorized to so declare by executive order.

Note: The investigations proposed by this bill would be a duplication of the activities and proper fields of existing agencies of the government, namely, the U. S. Bureau of Mines and U. S. Geological Survey.

H. R. 8526—Amending Title III, Tariff Act of 1930—Scrugham (Dem., Nevada). Committee on Ways and Means. Strikes out the last two sentences of Sub-section (a) (2) Section 350 (as previously amended by Trade Agreements Act of 1934) and in place thereof declares: "The proclaimed duties and other import restrictions and continuances shall not apply to articles the growth, produce, or manufacture of any other foreign country, whether imported directly or indirectly, unless the President finds that such other country agrees in return therefor to extend to the United States tariff concessions or other trade advantages of corresponding value.

H. R. 8992—Pollution of Navigable Waters Act, 1935 — Mansfield (Dem., Texas). (By request). Committee on Rivers and Harbors. Makes unlawful deposition of refuse matter or waste in any navigable water of the United States or in any place from which, in the ordinary course of events, any such refuse matter or waste would flow, float, seep, or be washed into any such navigable water. Defines "refuse matter or waste" as refuse matter and waste of every kind or character, including oil or oil sludge, raw untreated sewage, coal-mining washery waste, acid mine drainage, coal-distillation waste, pickling, cleaning, or plating waste, pulp or paper manufacture waste, canning waste, and washing, bleaching, or dyeing waste. Ad-

ministration under the Secretary of War, who may serve complaints and after due hearing issue cease and desist orders. Forfeitures of \$100 for each day of non-compliance. Authority to subpoena witnesses and books, papers, correspondence and memoranda.

H. J. Res. 48—Amending Constitution to Permit Congress to Reduce Hours of Work—Cresser (Dem., Ohio). Committee on the Judiciary. Amending the Constitution of the United States by introducing Article XX as follows: "To promote the general welfare, the Congress shall have power to reduce the number of hours of service per day and days per week for which contracts of employment may be lawfully made."

H. J. Res. 353—Appropriation for Rehabilitation of Mine Rescue Cars—Gray (Dem., Pennsylvania). Committee on Appropriations. Appropriates \$30,000 to be expended for placing two mine rescue cars in service under the Bureau of Mines. In introducing this bill the Congressman met the request of a section of the Joseph A. Holmes Safety Association of Spangler, Pa.

Trend of Ore Treatment

(Continued from page 23)

life of 121 years, meaning the year 2054.

To this period would be added many years of life due to whatever introductions would be made by way of large attack upon ore formation of the lower iron content, because in this instance the base widens for us as the crude ore iron-content is lowered. Competition from foreign ores sent in and inroads made by substitutes for steel will lengthen life. New ores resulting from explorations may cease to be consequential. Unexpected increases in demand for ore and lowering sales prices will shorten life. How the many factors will outbalance each other nobody knows. When the Lake Superior ores, viewed as part of the world reserve, were calculated in 1905 to become exhausted in 1925, Lake Superior ore-material was not subjected to a single form of ore treatment, while today we are adopting almost every form of ore-treatment and we are not adopting them because of ore shortage. We have even now a larger estimated reserve tonnage of marketable ore than was attributed to the region in 1905. We have set up a machinery specifically intended to prolong the life of the region rather than to hasten exhaustion. The mental attitude regarding the use of high-grade ore has also changed and instead of using, as before, only the best ores we conserve them to make possible absorbing available marginal types. The research work now in progress is directed to making sub-marginal types usable, as to which tonnage-estimates run into many billions. This constitutes

the incentive for engaging in research and forms the foundation and the crux of all that may be related about the life of the region.

CONCLUSIONS

We may conclude that:

(1) Treating Lake Superior ore-material began 30 years ago and was then deemed superfluous and applicable to a few special cases. Of the 65 units where ore is now being treated Minnesota has 44 plants and 13 different types of ore-treatment are applied. Developments in processing are increasing and attack is no longer confined to easily treated ores but has been extended to ore-bearing material which was long regarded unfit of being conserved. Treatment methods long regarded as not applicable are now accepted methods.

(2) Progress in ore-treatment methods has reversed the original view and treatment is now resorted to not only to facilitate the mine operation as a whole but to improve the physical condition and the chemical composition of ore-materials obtained from a certain mine, and to increase the value of the property and the operation.

(3) Dividing the total estimated tonnage of known ore by an average annual output contemplated as a future demand which was derived by projecting past records of production into the future, produces a result which should be regarded as the irreducible minimum of life.

(4) The collective effect of changes in practice of the industry, the political and economic reverses, the advances in ore-treatment, and the disclosure of new ore deposits has been experienced continuously in at least the past 20 years, during which period an average annual shrinkage in estimated reserves of 12 million tons has occurred and indicates that the Lake region should continue as a producer for 121 years and, very likely, longer.

(5) For some of the present companies the situation as to ore reserves may become acute long before the estimate of the minimum life has been reached. For some companies their own controlled reserves may be even now too short to be comfortable. For some companies a reserve lasting 25 to 30 or 30 to 35 years may be too costly to possess, and for that reason no company is apt to want to control a reserve good for 100 years or interest itself in a figure of that magnitude. The industry seeks to do no more than maintain a short reserve. Through improvements in the arts every indication now points to a total reserve lasting far beyond the year in which exhaustion was predicted 30 years ago or even 10 years ago. It seems certain then that that portion of our United States steel industry which is dependent on Lake ore may proceed on the premise that the Lake region may be counted on to produce an adequate annual tonnage for another century. What may happen after even 50 years may well be left to the analysts of the next generation.

SLAB ZINC STATISTICS (ALL GRADES) 1929-1935 — (TONS OF 2,000 LBS.)

	(1) Stock at Beginning	(2) Pro- duction	(3) Total Item (1) Plus Item (2)	(4) Ship- ments	(5) Stock at End	(6)* Shipped for Export	(7) Retorts Operating End Period	(8) Average Re- torts During Period	(9) Unfilled Orders End of Period	(10) Daily Average Production
1929	46,430	631,601	678,031	602,601	75,430	6,352	57,999	68,491	18,585	1,730
Monthly Average		52,633		50,217		529				
1930	75,430	504,463	579,893	436,275	143,618	196	31,240	47,769	26,651	1,355
Monthly Average		42,039		36,356		16				
1931	143,618	300,738	444,356	314,514	129,842	41	19,875	23,099	18,273	822
Monthly Average		25,062		26,210		3				
1932	129,842	213,531	343,373	218,517	124,856	170	21,023	18,560	8,478	583
Monthly Average		17,794		18,210		14				
1933	124,856	324,705	449,561	344,001	105,560	239	27,190	23,653	15,978	890
Monthly Average		27,059		28,667		20				
1934										
January	105,560	33,077	138,637	26,656	111,981	44	28,744	26,975	26,717	1,067
February	111,981	30,296	142,277	32,485	109,792	0	30,763	27,779	26,676	1,082
March	109,792	33,845	143,637	32,877	110,760	3	26,952	28,816	21,976	1,092
April	110,760	30,686	141,446	32,072	109,374	0	26,692	25,349	27,396	1,023
May	109,374	30,944	140,318	35,589	104,729	0	27,193	25,086	20,831	998
June	104,729	25,160	129,889	30,217	99,672	48	31,284	27,720	21,726	839
July	99,672	24,756	124,428	26,966	97,462	0	30,324	29,048	16,058	799
August	97,462	26,169	123,631	21,663	101,968	0	30,442	30,637	14,281	844
September	101,968	26,515	128,483	21,913	106,570	0	31,352	30,562	11,121	884
October	106,570	34,527	141,097	30,294	110,803	0	31,964	32,179	19,188	1,114
November	110,803	34,977	145,780	29,928	115,852	53	32,793	30,265	31,929	1,166
December	115,852	35,981	151,833	32,003	119,830	0	32,944	32,226	30,786	1,151
Monthly Average		366,933		352,663		148				
		30,578		29,389		12		28,887		1,004
1935										
January	118,005	35,135	153,140	35,455	117,385	0	32,658	32,230	25,993	1,133
February	117,385	33,468	151,153	34,877	116,276	33	33,210	33,157	25,816	1,195
March	116,276	36,735	153,011	41,205	111,806	0	35,196	32,535	20,000	1,185
April	111,806	35,329	147,135	38,455	108,680	3	29,691†	29,665†		
May	108,680	34,572	143,252	35,627	107,625	23	33,719	32,450	22,435	1,178
June	107,625	34,637	142,262	29,353	112,909	0	26,000†	29,467†		
July	112,909	35,120	148,029	32,306	115,723	0	32,389	30,387	35,878	1,115
August	115,723	35,547	151,270	38,824	112,446	0	25,709†	28,003†		
September	112,446	36,221	148,667	42,351	106,316	0	33,836	31,230	26,967	1,155
October	106,316	36,716	143,032	47,063	95,969	0	27,172†	28,814†		
November	95,969	37,469	133,438	48,172	85,266	0	33,884	31,244	36,939	1,133
December	85,266	40,136	125,402	41,466	83,936	0	27,374†	29,193†		
Monthly Average		431,085		465,154		59				
		35,924		38,763		5		32,341		1,181

* Export shipments are included in total shipments Item (4).

† Equivalent Retorts computed on 24 hour basis.

(NOTE: These statistics include all corrections and adjustments reported at the year-end.)

—From American Zinc Institute.

● THE OFFICE of the Division Engineer, North Pacific Division, Corps of Engineers, has recently completed a report entitled "Available Raw Materials for a Pacific Coast Iron and Steel Industry." The report, prepared by Dr. Edwin T. Hodge, consulting geologist, is a resume and analysis of present available information on domestic and foreign suitable supplies of ores, fluxes, etc., with probable cost of these raw materials delivered in the Lower Columbia River area, with some data relating to markets for

finished products. Copies of any or all of the four mimeographed volumes comprising the report may be seen at the office of the Division Engineer, North Pacific Division, 523 Pittock Block, Portland, Oreg.

● IN COMMEMORATION of its fiftieth birthday, on January 8, Westinghouse held a tremendous "family" gathering for the 12,000 employees in their Pittsburgh district with simultaneous meetings of Westinghouse employees in

every important Westinghouse factory and office in the country. Specifically, the occasion celebrates the fiftieth anniversary of the granting of the charter to the Westinghouse Electric Company.

A unique feature of this "family" gathering of 40,000 employees is that the complete Pittsburgh program was broadcast to all of the other meetings in plants and districts over Westinghouse's own short wave transmitter W8XX (on both 25.26 and 48.83 meters) and picked up by international representatives and friends in foreign countries.

Iron Ore Beneficiation

(Continued from page 30)

ing purposes without the consumption of considerable energy and drill steel. At some future time we may be able to disintegrate the rock in place by the use of some new force, but probably not within the next 35 years. We can, therefore, expect only the normal improvements in drilling, blasting, and mining methods which will be made by the perfection of existing processes. Perhaps a reduction in this cost of from \$0.15 to \$0.20 per ton of concentrate can be anticipated.

The crushing and grinding costs, amounting to \$1.05, can probably be reduced quite definitely. Much attention is being given to this problem at the present time. The number of work units actually consumed in crushing ore is comparatively small but since the efficiency with which crushing is done is low, the total cost is quite high. Since explosive shattering is being investigated and new types of crushing and grinding equipment are being developed, we may expect some definite reduction in the future in this cost. Perhaps we are justified in assuming a 25 percent reduction, which would bring this cost down to about \$0.80 per ton of concentrate.

Now, if a new set of costs are assembled showing the best that we can hope to accomplish in the next 30 years, the results will be about as follows:

Estimated Future Cost of Producing —200 Mesh Concentrate	
64 Percent Iron — 10 Percent Silica	
Taxes	\$0.40
Royalty	0.25
Mining—3 Tons	0.70
Transportation—3 Tons	0.15
Crushing and Fine Grinding— 3 Tons	0.80
Concentrating—3 Tons	0.20
Dewatering—1 Ton	0.03
Interest, Overhead, and Other Fixed Charges	0.45
Total	\$2.98

In this estimate you will notice that taxes have been increased. It is obvious that in the future all taxes must increase and in the face of this increase, no decrease can be expected in royalties. Interest, overhead, and other fixed charges are decreased because the necessary investments will be lowered with

the development of simplified mining and beneficiating methods. However, the best that can be hoped for is a probable cost of about \$3.00 per ton of fine concentrate. To this must be added the agglomerating cost if the ore is to be used in the present type of blast furnace.

The present cost of agglomerating fine iron concentrate at the mine is about \$1.00 per ton. There is no indication now that new agglomerating methods will be developed in the near future, although existing processes leave great opportunities for improvement. In the normal course of events, with the necessity for the agglomeration of greater tonnages of ore, larger and more efficient equipment will be developed and costs will be reduced. It does not seem probable, however, that agglomerating costs can be reduced, with existing processes, below \$0.50 per ton, especially since the fuel cost at the present time is about \$0.35 per ton. If the agglomerating cost, either before or after shipment, can be reduced to \$0.50 per ton, this cost added to the cost of the fine concentrate of \$3.00 per ton gives the cost of the agglomerated ore of about \$3.50 per ton.

At this point, attention should be called to the fact that the above costs do not include profit or carrying charges and, for this reason, cannot be compared with present Lake Erie ore prices. Large tonnages of reserve ore must constantly be maintained by the mining companies, and the cost of carrying these unproductive mines for 10 or 20 years is a large item of expense. It is difficult to predict just how the question of reserves will be handled in connection with the low grade ores which exists in such large quantities. The tax situation has an important bearing on this question and undoubtedly radical changes will be made in methods of taxation. The present ad valorem tax, which is a tax on the present worth of the ore in the ground, cannot be applied to low grade

ore that will not be mined for 200 years, in any manner that will be satisfactory either to the political subdivisions of the state or to the mining industry. The total tax paid by the mining industry of Minnesota amounts to between 15 and 20 million dollars per year. If the low grade ores of the future are required to carry this or a larger tax burden, the above cost estimates must be increased. The probability is, however, that most of the tax collected from the low grade ores will be on the basis of a sales or profit tax, and the ad valorem tax will be comparatively small. It would appear that this shift in taxes, when considered in connection with the enormous quantities of available low grade ore, will have the effect of reducing carrying charges.

All of this makes future cost estimates very uncertain but, from present indications, it seems probable that when the low grade ores are utilized, the cost of the iron units necessary for the production of a ton of pig iron will be about \$1.00 above present costs. The iron-silica ratio of this new ore will be a little better than with the present furnace ores, and the alumina, manganese, and phosphorous analyses will be a little lower. In order to provide this ore at the price estimated, much development work must be done and large investments for machinery and equipment must be made on the iron ranges. Many engineers will question the possibility of meeting the estimates presented above. If these estimates are too low, it means that just that much more development work must be done by the engineers and metallurgists at the smelters in order to keep the price of pig iron at its present level. The best that the ore producers can hope to do is to supply almost indefinitely an agglomerated ore of uniform grade and structure at a cost about 15 percent above present costs.

PETER F. LOFTUS

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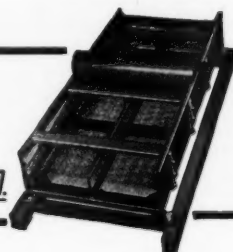
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RACINE — WISCONSIN



Machines as Servants Of Society

(Continued from page 24)

increased production based upon that stability.

To a considerable degree the question of a more even distribution of wealth is independent of questions of stability and of increase in general wealth. It is possible to have both with great inequalities in wealth. But for continued and increasing functioning of the economic machine it is necessary that the rich and well-to-do shall spend and not hoard. It is most desirable that they shall reinvest a sufficient percentage of their returns to balance the enormous losses of business as a whole, and in addition finance the new equipment needed for providing a rising standard of living to an increasing population. Furthermore, they should be willing to spend freely as so many have, in wise benefactions for the public good. It is even desirable that they spend for luxuries and personal service, and thus keep the flow of purchasing power active. These are the socially necessary uses of wealth. They do not prevent, they help, the social achievements which we set for ourselves.

The undesirable uses of wealth are:

(1) its devotion to speculation, particularly on margin as a basis for an unsafe credit structure such as has been described; (2) the loaning of wealth to finance speculative operations; and (3) hoarding. These activities militate against our social objectives.

However, though great inequality of distribution may not affect other elements adversely, it is undesirable in itself. Any wise social policy will tend to level up the returns to the lower paid workers by any and all means which do not decrease the total of production and distribution. This proviso is important, for the driving force of individual initiative in its reasonable hope for gain has often been forgotten, and no substitute has yet been found for it. The useful functions of wealth remain as we have described them. They can remain and serve as instruments for levelling up the remaining mass of the population.

In general, all the policies described work toward this end, also; and if we add to them the now well recognized principle that the main burden of taxation for the support of a wise and prudent government shall be borne to a major extent by those best able to carry it, we have the essentials of a wealth control policy which will produce and distribute more goods and services instead of reducing and rationing them to an under-privileged population.

The final item of our social policy will be the public provision of work at subsistence wages at all times for those able and willing to work; and the proper maintenance of those in need and unable to work. Thus will the fear of privation be removed from the souls of ourselves and our fellows.

The expenditures required for a thor-

ough-going relief policy will be enormous and difficult of financing—as they are now—if violent fluctuations in business are permitted and the increase of taxable income is discouraged. But with stability in our economic order and the encouragement of wealth production, the load will be both diminished in size and more easily borne. This is a consummation eagerly desired by all men of good will, of whatever station, occupation, or party.

Let us review the elements of our proposed policy for the proper operation and control of our machine civilization. They are as follows:

(1) A continuing trust in machinery and organization as the only source of an increased production of goods and services at lower cost—that is, the only source of a rising standard of living.

(2) Development of new monetary policies as a basis of stability, wherein the quantity and quality of credit is controlled from the standpoint of an adequate stream of purchasing power, increasing with population and with the rising standard of living.

(3) Discouragement of speculative activity and of the monetary, business, and employment disorders resulting from it.

(4) Preservation of effective competition as a natural means of (a) preventing destructive unbalances in industry, (b) lowering prices and increasing purchasing power, and (c) making governmental control of labor and industry unnecessary.

(5) Improvement of Federal Trade Commission practice to protect business from fraudulent competition and consumers from fraudulent goods.

(6) Immediate beginning of gradual removal of artificial governmental support for agriculture, labor, and industry, so as to permit the necessary redistribution of workers and capital to bring the depressed industries and their dependent population into a safe, natural balance.

(7) General encouragement of the production of wealth from productive business.

(8) General dependence on the income tax for the expenses of prudent government.

(9) Provision of simple subsistence for the entire population at all times, to be given only in return for honest, useful work for those able to work, by

direct support in case of disability by reason of youth, age, or ill health; this policy becoming practical for the first time as the preceding policies reduce human need and multiply national resources.

This is a program of progress, not of reaction. It recognizes the mistakes of the past, draws lessons from them, and moves forward into a better future.

It is most important to observe that every element of it can be carried out under our Constitution as it now stands.

Those who contend that social progress requires a change in that document are following false doctrines. They seek to arm the Federal Government with new powers of control which we have seen to be fatal to the ends sought, and which in practice will be destructive of government as we have known it.

To give the legislative and administrative branches power over the details of the economic life of our citizens would seem at first to strengthen government. But the measure in which we have essayed to do this has already pointed its warnings. Congress has become the battleground of specific economic units, seeking specific advantage. In such a melee a rounded national program becomes an impossibility and representative government a farce.

The experience of European parliaments under similar conditions is that legislation is blocked, and the executive perforce becomes a dictator.

It does not matter that the legislative branch has no intention of surrendering its functions. It does not matter if the executive abhors the idea of dictatorship. The course of events is an irreversible one when once decisively entered upon. No nation has yet made a return ascent to liberty, democracy, and plenty.

For us the fatal step will be a constitutional revision which makes the Federal Government arbiter of the details of the daily business of farmer, worker, and employer. That step must not be taken.

The danger is that we who are intent on freedom may permit ourselves to be maneuvered into the position of defending the Constitution as against human needs. The contest is already shaping in those terms. It would be incredibly calamitous for us to be drawn further into this absurdity.

As we have seen, the Constitution stands hand in hand with and supports the program which will best serve human needs and preserve human rights.

Our war cry is not merely "Save the Constitution," but rather "Save the Constitution for the sake of human progress." On that issue we cannot be beaten.

● "COAL THROUGH THE AGES," by H. N. Eavenson, is now available at \$1.50 per copy, from the American Institute of Mining and Metallurgical Engineers, 29 West 39th Street, New York City. In this volume the development of the coal industry and its influence upon civilization are presented.



The Manufacturers Viewpoint

● A NEW BULLETIN describing their line of power-driven, horizontal duplex, double-acting, cross-head type, moderate speed, heavy-duty compressors has just been issued by Ingersoll-Rand. The capacities covered range from 50 to 250 horsepower for single or multi-stage compression. The types covered are the "XRE", which are direct-connected, synchronous motor-driven units; and the "XRB" and "XCB", which are belt driven. All types are equipped with the new I-R Channel Valve. Copies of the new bulletin (No. 3162) may be had by writing Ingersoll-Rand, 11 Broadway, New York City, or any branch office.

● THE VOLUME of electrical manufacturing business in 1935, according to Gerard Swope, president, General Electric Company, was approximately 30 percent greater than in 1934, which was about the same increase as was shown for 1934 over 1933. Consumption of electricity in the United States was the greatest in the history of the country, being about 7 percent more than in 1934 and 3 percent more than in 1929, the previous peak year. As I said last year, this has been due largely to increased use of electrical appliances in the home. Orders for capital goods in the electrical manufacturing industry have not increased to any great extent, because of the difficult position of the public utilities and transportation companies throughout the United States. Practically the only increase in the production of capital goods has been brought about by the modernization of industrial plants. Successive increases in the use of electricity must eventually mean an increase in the generating capacity of public utilities, which will bring an increase in orders for capital goods to the electrical manufacturing industry. For the year 1936 we look forward to a continued improvement in business.

● "AIR-SAND" dry cleaners for coal preparation plants are to be built and sold by Stephens-Adamson Mfg. Co., of Aurora, Ill., according to recent announcement by the Hydrotator Co., of Cleveland.

Thomas Fraser, who developed the "Air-sand" process, is being transferred to the Stephens-Adamson organization to supervise engineering and construction.

● AN ANTI-FREEZE system for air lines (Tanner Tank and Tannergas) is described in a circular just published by the Sullivan Machinery Company.

The tank is cut into the air line by a few simple connections and partially filled with Tannergas in liquid form. The by-passed air agitates the liquid, creating a dry gas which enters the line and treats the moisture in the air. Guaranteed to prevent freezing at 70° below zero. Odorless, harmless, non-explosive. Built to A.S.M.E. specifications. In use by large mines, quarries, and contractors. Ask for circular. Sullivan Machinery Company, 1600-C Bell Building, Chicago, Ill.

● WRIGHT MANUFACTURING DIVISION of American Chain Company, Inc., York, Pa., announces a complete line of air compressors. These will be distributed exclusively through the industrial and mill supply accounts. The Wright Compressor line will include both single- and double-stage units in the permanent and portable styles. A complete catalog will be sent on request.

● ANNOUNCEMENT is made by Link-Belt Company, Philadelphia, that it has developed and is now in production on a new line of cut-tooth worm gear speed reducers of simple, compact, accessible construction, offering great flexibility of driving arrangement. A 40-page, illustrated catalogue, No. 1524, has been pre-



pared, giving dimensions, service factors, A.G.M.A. horsepower ratings, and engineering data for selection of the right reducer unit. This book will be sent gratis to any reader upon request addressed to the company at 2045 West Hunting Park Avenue, Philadelphia, or nearest office.

● EVEN AS LOW as one part of mercury vapor in a hundred million parts of air by volume can be detected and registered by a device which has been announced by the General Electric Company. Mercury in appreciable quantities is used in numerous industries, and it is important that mercury vapor in the air be kept at a minimum.

In the new device the mercury vapor is detected by means of selenium sulphide, a light yellowish chemical compound which is turned brown by exposure to the vapor. Knowing how long the selenium-treated paper has been exposed, and determining the intensity of the brown by comparison with a chart, the concentration of the mercury vapor can be determined quickly.

Equipment was previously available for using selenium sulphide as a mercury detector, but that equipment was relatively expensive and required a more skilled operator. The new equipment consists of an aluminum shade or cone, about four inches in diameter at the bottom, two inches in diameter at the top, and eight inches high. Within the cone is a holder for a strip of selenium sulphide paper. This cone is fitted to a heavy-duty lampholder, with a socket for a 25-watt red Mazda bulb. A red lamp is used since the actinic rays of a clear bulb would turn the paper pink when in an unusually hot room. The lampholder has a half-inch standard pipe thread, so that the mounting can be arranged easily for floor or table stand or for a wall bracket.

Heat from the red lamp causes a fairly constant flow of warmed air up through the cone, so that the apparatus may be calibrated to show the concentration of mercury vapor in a room. A "windshield" cylinder on top of the cone prevents cross drafts in the room from affecting the air flow against the paper.

The color scale provided with the equipment has six colors uniformly graduated from the lightest color distinctly visible, to the darkest color which is produced when all the selenium sulphide is consumed. The chemically treated paper is supplied in strips seven-eighths inch wide and 62 inches long, wound on spools and in air- and light-tight containers.

● THE agreement made between Safety Mining Company and the Sullivan Machinery Company, whereby Sullivan was licensed to develop Airdox, has been modified by mutual agreement. After January 1, 1936, the future development and marketing of Airdox will again be handled by Safety Mining Company.

● **WITH A CAPACITY** of 50 tons at one scoop, the world's largest power shovel has recently been put into operation by the Northern Illinois Coal Corporation. The new giant was built by the Marion Steam Shovel Company, of Marion, Ohio, and its electric drive and control equipment was furnished by the General Electric Company.

The outstanding feature of the huge machine is its immense dipper, or bucket, which has a rated capacity of 32 cu. yds., struck measure, or approximately 40 cu. yds. heaped up—enough to fill an ordinary room at one scoop. In coal stripping operations where it will be handling earth, shale, and broken rock, the weight of one dipper load is approximately 50 tons.

The dipper itself is fabricated from aluminum plates and castings, with an armor of special wear-resisting steel at the points where the greatest wear is encountered. The use of aluminum results in a marked saving in weight over the ordinary all-steel construction and this saving in weight permits the carrying of greater pay loads with little or no increase in the duty of the mechanical parts or of the electric equipment. The dipper is roughly 9 2/3 ft. by 8 1/3 ft. by 16 1/3 ft. The largest dipper previously used is of 20 cu. yds. capacity, of a light-weight all-steel construction weighing 40 to 50 percent more than the larger aluminum dipper of the new giant.

The new shovel has a boom over 100 ft. long and a dipper handle or stick in excess of 65 ft. in length. Material can be picked up at the working level and deposited at a point 70 ft. above this level. A mental picture of this operation is obtained when it is imagined that this shovel can pick up a 50-ton load and place it on the sixth or seventh floor of an ordinary office building.

The equivalent ratings of all the motors and generators on the shovel total more than 3,500 hp., including a newly developed magnetic control method. With the General Electric system of voltage control for shovel operation, slight pressures of the operator's hands on master switch handles produce working pressures of several hundred thousand pounds at the dipper teeth.

● **MANY** money saving applications of the Sullivan utility hoists are suggested in bulletin 76-X—a 12-page two-color book just issued. These compact yet powerful hoists handle materials lifting on construction jobs—assembling cars—decking logs—timbering mines—trimming coal piles. Single and double drum types. Electric and compressed air drive. Simple operation, convenient controls, ample safety. Ask for bulletin 76-X, Sullivan Machinery Company, 1600-A Bell Building, Chicago, Ill.



J. E. N. Hume

● **J. E. N. HUME**, assistant manager of the General Electric Company's industrial department, has been appointed manager of the department, succeeding the late W. W. Miller, it was announced December 26 by E. O. Shreve, vice president of the company. Mr. Hume has been assistant manager for the previous six years and in that capacity was responsible for general sales direction, policies, prices, consignments, and similar activities of the department.

A native of Virginia, Mr. Hume attended school in and near Washington, D. C., then entered the University of Virginia, and was graduated in 1906 with the degree of electrical engineer. In January, 1907, he entered the G-E student engineering or "test" course and, upon completing it, saw service in the company's switch-gear and lighting departments and in its Baltimore office. On April 15, 1912, he entered the industrial department, then known as the power and mining department, and has been engaged there ever since. In 1928 he was made manager of motor sales, and in December, 1929, assistant manager of the department, the position he held at the time of his recent appointment to the managership.

● **F. A. MERRICK**, president, Westinghouse Electric & Manufacturing Company, in his New Year message said:

"The course in which business runs is the resultant of many forces. When the major forces work in opposing and varying directions, uncertainty is introduced and progress is impeded. During the year now ending, both economic and political influences have been at work. The latter have been divided between the recovery effort and the effort to reform or, perhaps, rather to remake our scheme of government and our social life. It is becoming increasingly evident that a haphazard pursuit of these latter objectives is inimical to recovery of our business equilibrium, and that such problems should be approached through the orderly procedure provided in our fundamental law. The decisions of the Su-

preme Court to this effect have given renewed confidence and thereby strengthened the foundation for business recovery.

"The outlook for the electrical manufacturing industry seems especially sound because the mounting sales of electricity will doubtless increase still further in the coming year. The use of electricity in the home has been largely responsible for the growth of central station load during the years of depression and when anything like normal industrial and commercial load reappears, there will be a sharp demand for generating equipment which will provide for the manufacturing end of the business the class of activity which has been entirely lacking for the past three or four years.

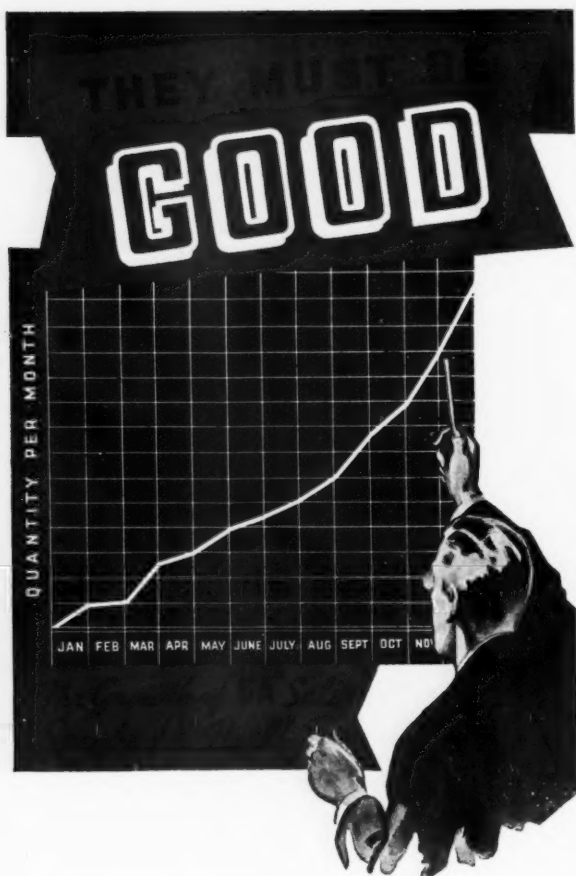
"In addition to this, it is still a fact that new uses for electricity are daily developing while the old uses for electricity are constantly expanding."

● **GEORGE H. REID** has been appointed industrial department manager of the General Electric Company's New York district, succeeding Fred S. Hartman who retired at the close of the year, according to a recent announcement made by H. H. Barnes, Jr., commercial vice president of the company. The appointment became effective January 1, 1936. Mr. Hartman's services, Mr. Barnes stated, will still be available to the company in an advisory capacity.



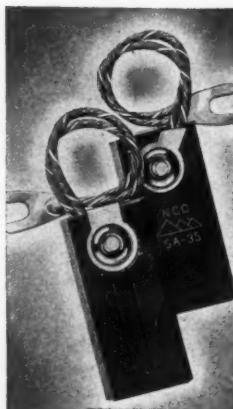
Ralph Leavenworth

● **R. R. DAVIS**, formerly assistant manager of the advertising department of Westinghouse Electric & Manufacturing Company, at East Pittsburgh, Pa., will succeed Ralph Leavenworth, who has resigned as manager, as of January 1, 1936, according to announcement by N. G. Symonds, vice president. Mr. Leavenworth will join Fuller & Smith & Ross, Cleveland, advertising agency which handles the Westinghouse account.



OPERATORS and electrical manufacturers alike have indicated their acceptance of the new "SA" Series Brushes by ordering again and again. A steadily rising sales curve reflects the universal satisfaction these brushes are giving—They **MUST** Be Good.

The "SA" Series consists of five electro-graphitic grades—SA-25, SA-30, SA-35, SA-40 and SA-45. These grades, definitely graduated in performance characteristics, cover a wide range of application on motors and generators in power and industrial service.



Their established superior performance merits a trial on your equipment.

There is a National Pyramid Brush for every class of service.

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in defending the industry in its legislative and economic problems.

in acquiring greater safety and efficiency in its production problems.

as an informative agency looking to a better understanding of the importance of minerals in our industrial life.

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37 per cent of the world's coal;
45 per cent of the world's iron;
42 per cent of the world's copper;
36 per cent of the world's lead;
41 per cent of the world's zinc;

and which directly or indirectly, through the production and processing of minerals, furnish a livelihood for some *25-million people*, employ *more than one million men* at an annual payroll of *more than a billion dollars*.

. . . . On those problems of common origin and application the American Mining Congress presents the united front of the industry. It has done so for thirty-eight years. Its leadership is subject to the will of the mining industry. It offers its services to every person interested in the protection of, the upbuilding of, the successful operation of the mines of this country.

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THE M.S.A. COMFO-RESPIRATOR now bears the official approval of the U. S. Bureau of Mines. High in protective efficiency, low in breathing resistance, *weighing less than 5 ounces*, the Comfo-Respirator is acclaimed by users as the most comfortable and efficient dust protector available. First cost is low, and filters last longer than in old-style respirators. Send for Bulletin CR-1, or let us demonstrate the Comfo-Respirator under *your* conditions.

EDISON ELECTRIC CAP LAMPS are the most popular and widely used mine lamps made (*more than 300,000 in daily use.*) Profit by the experience of all these miners and their operators . . . realize what it can mean to you in reduced accidents and compensation costs,—in increased production efficiency, too,—to equip your men with the brighter, steadier, *more reliable* working light that Edison Cap Lamps afford. Write for our rental plan of purchase,—requiring no initial outlay.

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